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SOIL AND LAND CAPABILITY ASSESSMENT AS PART OF THE ENVIRONMENTAL ASSESSMENT AND AUTHORISATION PROCESS FOR THE PROPOSED RIETKOL MINING OPERATION NEAR DELMAS IN THE MPUMALANGA PROVINCE

Prepared for

Jacana Environmentals CC

August 2021

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Report Reference: SAS 215334
Date: April 2018
Revised: August 2021

EXECUTIVE SUMMARY

Scientific Aquatic Services (SAS) CC was appointed to conduct a Soil and Land Capability assessment for the proposed Rietkol opencast silica mine. The proposed Rietkol Mining Operation (Rietkol Project) is situated within Wards 8 and 9 of the Victor Khanye Local Municipality and the Nkangala District Municipality. Soil and land capability surveys were conducted on 16 February 2016 and 6 December 2016. The assessment involved evaluating physical soil properties and current limitations to various land use purposes. Subsurface soil observations were made using a manual hand auger in order to assess individual soil profiles.

From this assessment, it was found that the dominant land use activities within the Mining Right Application (MRA) area include animal and crop farming. Sandstone outcrops were observed where the bedrock is exposed on the ground surface around the crest (hilltop) landscape position. This is indicative of intense erosion likely attributed to historic land uses, particularly overgrazing. Abandoned buildings and other non-soil features including residual concrete structures from historic infrastructure were also identified within the MRA area, and such areas and other existing buildings (mostly residential properties) were classified as Witbank (anthrosols).

The dominant soil types included Hutton (Hu), Clovelly (Cv), Mispah/Glenrosa/Dresden (Ms/Gs/Dr), Katspruit (ka) and Pinedene (Pn) soil forms identified within the investigated MRA area. The MRA area is dominated by Hutton and Clovelly soil forms, which collectively constitute approximately 92.5 ha, amounting to 41.8% of the MRA area. Katspruit soils which are associated with wetland resources constitute approximately 52.8 ha, which amounts to 23%. Rocky outcrops constitute approximately 31.2 ha, equating to 14.1%, whilst the shallow Mispah/Glenrosa/Dresden soil forms occupy approximately 15.1 ha, which amounts to 6.8% of the MRA area. The remainder of the study area is occupied by residential properties, Witbank (Anthrosols) as well as Westleigh/Avalon and Pinedene soil forms, as presented in the table below.

Land Capability classes for soil forms identified within the MRA area.

Soil Form	Total Area (Ha)	% Areal Extent
Hutton/Clovelly	92.5	41.8
Rocky Outcrop	31.2	14.1
Westleigh/Avalon	20.5	9.3
Mispah/Glenrosa/Dresden	15.1	6.8
Witbank (Witbank (anthrosols))	3.7	1.7
Pinedene/Fernwood	1.4	0.6
Wetland	50.8	23
Residential Properties	6.0	2.7
Total Area	**221.2**	**100**

The findings of this assessment suggest that the relevant soil limiting factors within the MRA area for land capability and land use potential include the following:

- Waterlogging within the permanent zone of the pan and seep wetland to the east of the MRA area. Protection of wetland resources according to the National Water Act, 1998 (Act No. 36 of 1998) takes precedence;
- Limited rooting depth due to periodic waterlogging of the Westleigh and Avalon soil forms within the inundated zone of the artificial impoundments within the hillslope seep wetland. Similar to Pinedene and Fernwood soils preservation of these soils for conservation purposes takes precedence, according to the National Water Act, 1998 (Act No. 36 of 1998);
- Shallow effective rooting depth due to shallow indurated bedrock of the Mispah/Glenrosa/Dresden soil forms. As such, these soils are not considered to contribute significantly to agricultural productivity; and
- Lack of soil medium for plants and crop growth for the rocky outcrop, residential areas and Witbank (anthrosols).

From a land capability point of view, the proposed MRA area presents extensive areas of deep, well drained and well aerated soils with high agricultural potential soils, comprising just over 40% of the total MRA area, whilst the rest of the MRA area is comprised of wetlands as well as soils not considered prime soils for agricultural production. The extent of Hutton/Clovelly soils thereof should be considered sufficient for viable cultivated small commercial farming, and thus should be avoided where feasible to minimise the loss of soil resources for current and future agricultural production. Of the 92.5 ha (41.8 %) of prime agricultural soils (Hutton/Clovelly) within the MRA area;

- 9.2 ha will be affected by the proposed surface infrastructure;
- 5.2 ha will be affected by the main mining block; and
- None will be affected by the north mining block.

Therefore, a total of 14.4 ha of prime agricultural soils is anticipated to be affected by the proposed mining project, however this can be reduced if mitigation measures, and recommendations outlined in this document are considered. The disturbance of prime agricultural soils is unavoidable however the resultant impact on these soil resources will be limited to the demarcated portion(s). Livestock commercial farming is not considered ideal for this area due to the veld being classified as a transformed rangeland attributable to historic anthropogenic activities and over grazing, as depicted in Figure 8. From a soil and land capability perspective, approximately 40 percent of the proposed MRA area is capable of supporting cultivated commercial agricultural production due to occurrence of prime agricultural, adequate rainfall as well availability of irrigation options.

It is acknowledged that the grazing capacity as indicated by the Department of Agriculture, Land Reform and Rural Development (2021) [(Ref: MP 30/5/1/2/3/2/1 (10124)] is 3 ha/LSU based on the 1993 grazing capacity index, the veld has been transformed due to overgrazing and other historic anthropogenic activities. The veld is best described as a transformed rangeland. Other limitations include rocky outcrops (low productivity Mispah soils) which are not suitable for any cultivated agricultural related activities. As such, the grazing capacity livestock commercial farming is not considered ideal for this area and a grazing capacity of 3 ha/LSU is unlikely to be achieved across the majority of the proposed extent of the mining footprint.

It is the opinion of the specialist, based on the information presented above, that this study provides the relevant information required to inform the Environmental Impact Assessment of the project to ensure that appropriate consideration of the agricultural resources in the study area will be made in support of the principles of Integrated Environmental Management (IEM) and sustainable development.

Declaration

This report has been prepared according to the requirements of Section 32 (3b) of the Environmental Impact Assessments EIA Regulations, 2010 (GNR 543). We (the undersigned) declare the findings of this report free from influence or prejudice.

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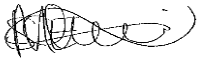

Sinethemba E. Mchunu Date: 10/04/2018

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Stephen van Staden Date: 10/04/2018

DOCUMENT GUIDE

No.	Requirement	Section in report
a)	Details of -	
(i)	The specialist who prepared the report	Appendix C
(ii)	The expertise of that specialist to compile a specialist report including a curriculum vitae	Appendix C
b)	A declaration that the specialist is independent	Appendix C
c)	An indication of the scope of, and the purpose for which, the report was prepared	Section 1
cA)	An indication of the quality and age of base data used for the specialist report	Section 3
cB)	A description of existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change	Section 4
d)	The duration, date and season of the site investigation and the relevance of the season to the outcome of the assessment	Section 2
e)	A description of the methodology adopted in preparing the report or carrying out the specialised process inclusive of equipment and modelling used	Section 2
f)	Details of an assessment of the specific identified sensitivity of the site related to the proposed activity or activities and its associated structures and infrastructure, inclusive of a site plan identifying site alternatives	Section 3
g)	An identification of any areas to be avoided, including buffers	Section 3
h)	A map superimposing the activity including the associated structure and infrastructure on the environmental sensitivities of the site including areas to be avoided, including buffers	Section 3
i)	A description of any assumption made and any uncertainties or gaps in knowledge	Section 1.1
j)	A description the findings and potential implication\s of such findings on the impact of the proposed activity, including identified alternatives on the environment or activities	Section 4
k)	Any mitigation measures for inclusion in the EMPr	Section 4
l)	Any conditions for inclusion in the environmental authorisation	Section 4
m)	Any monitoring requirements for inclusion in the EMPr or environmental authorisation	Section 4
n)	A reasoned opinion -	
(i)	As to whether the proposed activity, activities or portions thereof should be authorised	Section 6
(iA)	Regarding the acceptability of the proposed activity or activities	Section 6
(ii)	If the opinion is that the proposed activity, activities or portions thereof should be authorised, any avoidance, management and mitigation measures that should be included in the EMPr, and where applicable, the closure plan	Section 6
o)	A description of any consultation process that was undertaken during the course of preparing the specialist report	N/A
p)	A summary and copies of any comments received during any consultation process and where applicable all responses thereto; and	Appendix B
q)	Any other information requested by the competent authority	N/A

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GLOSSARY OF TERMS

Catena	A sequence of soils of similar age, derived from similar parent material, and occurring under similar macroclimatic condition, but having different characteristics due to variation in relief and drainage.
Chromic:	Having within ≤150 cm of the soil surface, a subsurface layer ≥30 cm thick, that has a Munsell colour hue redder than 7.5YR, moist.
Ferralic:	Having a ferralic horizon starting ≤150 cm of the soil surface.
Ferralic horizon:	A subsurface horizon resulting from long and intense weathering, with a clay fraction that is dominated by low-activity clays and contains various amounts of resistant minerals such as Fe, Al, and/or Mn hydroxides.
Gleying:	A soil process resulting from prolonged soil saturation which is manifested by the presence of neutral grey, bluish or greenish colours in the soil matrix.
Hard Plinthic	Accumulative of vesicular Fe/Mn mottles, cemented
Hydrophytes:	Plants that are adaptable to waterlogged soils
Lithic	Dominantly weathering rock material, some soil will be present.
Mottles:	Soils with variegated colour patterns are described as being mottled, with the "background colour" referred to as the matrix and the spots or blotches of colour referred to as mottles.
Plinthic Catena	South African plinthic catena is characterised by a grading of soils from red through yellow to grey (bleached) soils down a slope. The colour sequence is ascribed to different Fe-minerals stable at increasing degrees of wetness
Red Apedal	Uniform red colouring, apedal to weak structure, no calcareous
Runoff	Surface runoff is defined as the water that finds its way into a surface stream channel without infiltration into the soil and may include overland flow, interflow and base flow.
Orthic	Maybe dark, chromic or bleached
Soil Map Unit	A description that defines the soil composition of a land, identified by a symbol and a boundary on a map
Soft Plinthic	Accumulation of vesicular Fe/Mn mottles (>10%), grey colours in or below horizon, apedal to weak structure
Witbank	Man-made soil deposit with no recognisable diagnostic soil horizons, including soil materials which have not undergone paedogenesis (soil formation) to an extent that would qualify them for inclusion in another diagnostic horizon

ACRONYMS

AGIS	Agricultural Geo-Referenced Information Systems
°C	Degrees Celsius.
EAP	Environmental Assessment Practitioner
EIA	Environmental Impact Assessment
ET	Evapotranspiration
IEM	Integrated Environmental Management
IUSS	International Union of Soil Sciences
FAO	Food and Agriculture Organization
GIS	Geographic Information System
GPS	Global Positioning System
Hu/Cv	Hutton/Clovelly
m	Meter
MAP	Mean Annual Precipitation
Ms/Gs/Dr	Mispah/Glenrosa/Dresden soil forms
NWA	National Water Act
PSD	Particle Size Distribution
SACNASP	South African Council for Natural Scientific Professions
SAS	Scientific Aquatic Services
SOTER	Soil and Terrain
We/Av	Westleigh/Avalon soil forms

1. INTRODUCTION

Scientific Aquatic Services (SAS) CC was appointed to conduct a Soil and Land Capability assessment for the proposed Rietkol opencast silica mine. The proposed Rietkol Mining Operation (Rietkol Project) is situated within Wards 8 and 9 of the Victor Khanye Local Municipality and the Nkangala District Municipality. The Mining Right Application (MRA) area is situated approximately 6km west of the town of Delmas/ Botleng. The Mining Right Application (MRA) area is further situated approximately 900m southeast of the N12, 2.1 km southwest of the R50, and 2.7 km north of the R555 (Figure 1 & 2).

The MRA area covers has an extent of 221 ha, and consists of

- 16 Modder East Agricultural Holdings on the farm Olifantsfontein 196IR;
- Portion 71 of the farm Rietkol 237 IR; and
- A portion of the remaining extent of Portion 31 of the farm Rietkol 237 IR.

1.1 Project Description

Silica is planned to be mined by means of conventional opencast methods to a depth of between 30 and 50 meters below surface (mbs). The proposed Rietkol Project estimated life of mine (LOM) is 20 years, although further exploration drilling to be conducted during the operational phase, may increase the LOM and the depth of mining if resources proof viable (Jacana, 2018).

The following infrastructure is associated with the proposed project (Figure 3):

- Opencast pits;
- Processing plant (i.e. crushing, wash plant, screening etc.);
- Product Stockpiles;
- Administration office facilities (i.e. security building, administration and staff offices, reception area, ablution facilities, etc.);
- Access Roads; and
- Clean and dirty water management infrastructure.

1.2 Site Sensitivity Verification Statement

Nhlabathi applied for a Mining Right to mine silica in February 2018 and commenced with the Environmental Impact Assessment (EIA) process as contemplated in the National Environmental Management Act 107 of 1998 (NEMA) and Government Notice (GN) No. R. 982-986 of 4 December 2014: NEMA: Environmental Impact Assessment Regulations, as amended (2014 EIA Regulations), for the Rietkol Project.

Several specialist studies were conducted within the Mining Right Application (MRA) area in support of the EIA process, and a comprehensive Public Participation process was initiated. The Final Scoping Report was submitted on 3 April 2018 and accepted by the Department of Mineral Resources and Energy (DMRE) on 26 April 2018. However, the MRA was rejected by the DMRE Mpumalanga Mine Economics Directorate on the basis that the MRA formed part of another right granted in terms of the MPRDA. This decision resulted in a delay in the EIA process, ultimately causing the application for Environmental Authorisation to lapse.

Nhlabathi has recently re-initiated the MRA process and applied for a Mining Right over the same farm portions in early 2020. The MRA was accepted by the DMRE on 21 January 2021 and Nhlabathi has since re-initiated the EIA process with Jacana Environmentals cc (Jacana) appointed as the independent Environmental Assessment Practitioner (EAP).

Several additional requirements when applying for Environmental Authorisation (EA) have emerged since the 2018 EIA process, including but not limited to:

1. Notice was given in Government Notice No. 960 (GN 960) dated 5 July 2019 of the requirement to submit a report generated by the National Web Based Environmental Screening Tool in terms of section 24(5)(h) of the NEMA and regulation 16(1)(b)(v) of the 2014 EIA Regulations. Such a Screening Rreport became compulsory when applying for an EA 90 days from publication of GN 960 (5 October 2019). The purpose of the Screening Report is to identify the list of specialist assessments that needs to be conducted in support of the EA application, based on the selected classification, and the environmental sensitivities of the proposed development footprint.
2. Government Notice No. 320 (GN 320) dated 20 March 2020 prescribes general requirements for undertaking site sensitivity verification and for protocols for the assessment and minimum report content requirements of environmental impacts for environmental themes for activities requiring EA in terms of sections 24(5)(a), (h) and 44 of NEMA. These procedures and requirements came into effect 50 days after publication of GN 320 (15 May 2020). The purpose of the site sensitivity verification is to verify (confirm or dispute) the current use of the land and the environmental sensitivity of the site under consideration as identified in the Screening Report. This will determine the level of assessment required for each environmental theme, i.e. Specialist Assessment or Compliance Statement.

As indicated above, several specialist studies were commissioned for the Rietkol Project during 2016-2018 in support of the previous application, including:

- Soils, land use and capability, Hydropedology;
- Terrestrial / Aquatic Biodiversity;

- Groundwater;
- Air Quality;
- Ambient Noise;
- Blasting & Vibration;
- Traffic;
- Heritage and Cultural Resources;
- Palaeontology;
- Visual and Aesthetics;
- Social;
- Hazard Identification and Risk Assessment (HIRA); and
- Land Trade-off & Macro-Economic Analysis.

Comprehensive specialist assessments were conducted for all the environmental and social themes listed above, irrespective of the sensitivity identified by the specialist assessment (2018) or the Screening Report. Therefore, no site sensitivity verification has been done for this EA application as all themes have been considered to have a **high to very high sensitivity**, requiring a full Specialist Assessment.

The list of specialist assessments listed in the Screening Report and the extent to which it has been addressed in the re-application for EA for the Rietkol Project is indicated below. Where applicable, motivation is provided for the exclusion of certain specialist assessments.

GN 960 requirement	**Extent to which it is included in the Plan of Study**
Agricultural Impact Assessment	Soil and Land Capability Assessment by Scientific Aquatic Services.
Landscape/Visual Impact Assessment	Visual Impact Assessment by Scientific Aquatic Services.
Archaeological and Cultural Heritage Impact Assessment	Phase 1 Heritage Impact Assessment by R&R Cultural Resource Consultants.
Palaeontology Impact Assessment	Palaeontology Impact Assessment by ASG Geo Consultants (Pty) Ltd {Dr Gideon Groenewald}.
Terrestrial Biodiversity Impact Assessment	Faunal, Floral and Freshwater Assessment by Scientific Terrestrial Services.
Aquatic Biodiversity Impact Assessment	Faunal, Floral and Freshwater Assessment by Scientific Terrestrial Services.
Hydrology Assessment	Baseline Water Quality Assessment by Scientific Aquatic Services. Water Management Plan – Preliminary Design Report by Onno Fortuin Consulting.
Noise Impact Assessment	Environmental Noise Impact Assessment by Enviro Acoustic Research.
Radioactivity Impact Assessment	Waste Classification by Groundwater Complete.

GN 960 requirement	Extent to which it is included in the Plan of Study
	Analysis will include Uranium and Thorium to determine potential for radioactivity within the resource.
Traffic Impact Assessment	Traffic Impact Assessment by Avzcons Civil Engineering Consultant.
Geotechnical Assessment	A geotechnical assessment will be undertaken as part of the engineering package for the project, if required. This is not included in the application for EA.
Climate Impact Assessment	A greenhouse gas emissions statement is included in the Air Quality Impact Assessment by EBS Advisory.
Health Impact Assessment	Hazard Identification and Risk Assessment by AirCheck Occupational Health, Environmental & Training Services.
Socio-Economic Assessment	Socio-Economic Impact Assessment by Diphororo Development.
Ambient Air Quality Impact Assessment	Air Quality Impact Assessment by EBS Advisory.
Seismicity Assessment	A Blasting Impact Assessment is included and has been conducted by Blast Management Consulting. It deals extensively with the potential impact in respect of air blast and vibration from blasting operations.
Plant Species Assessment	Part of Terrestrial Biodiversity Impact Assessment.
Animal Species Assessment	Part of Terrestrial Biodiversity Impact Assessment.

Further studies that are not included in the GN 960 requirements, but were commissioned for the Rietkol Project, are:

- Hydropedological Assessment by Scientific Aquatic Services.
- Geohydrological Investigation by Groundwater Complete.
- Blasting Impact Assessment by Blast Management Consulting.
- Land Trade-off Study and Macro-Economic Impact Analysis by Mosaka Economic Consultants.
- Rehabilitation, Decommissioning and Closure Plan by Jacana Environmentals.

Where a specific environmental theme protocol has been prescribed by GN 320, the specialist assessment will adhere to such protocol. Where no protocol has been prescribed, the report will comply with Appendix 6 of the EIA Regulations.

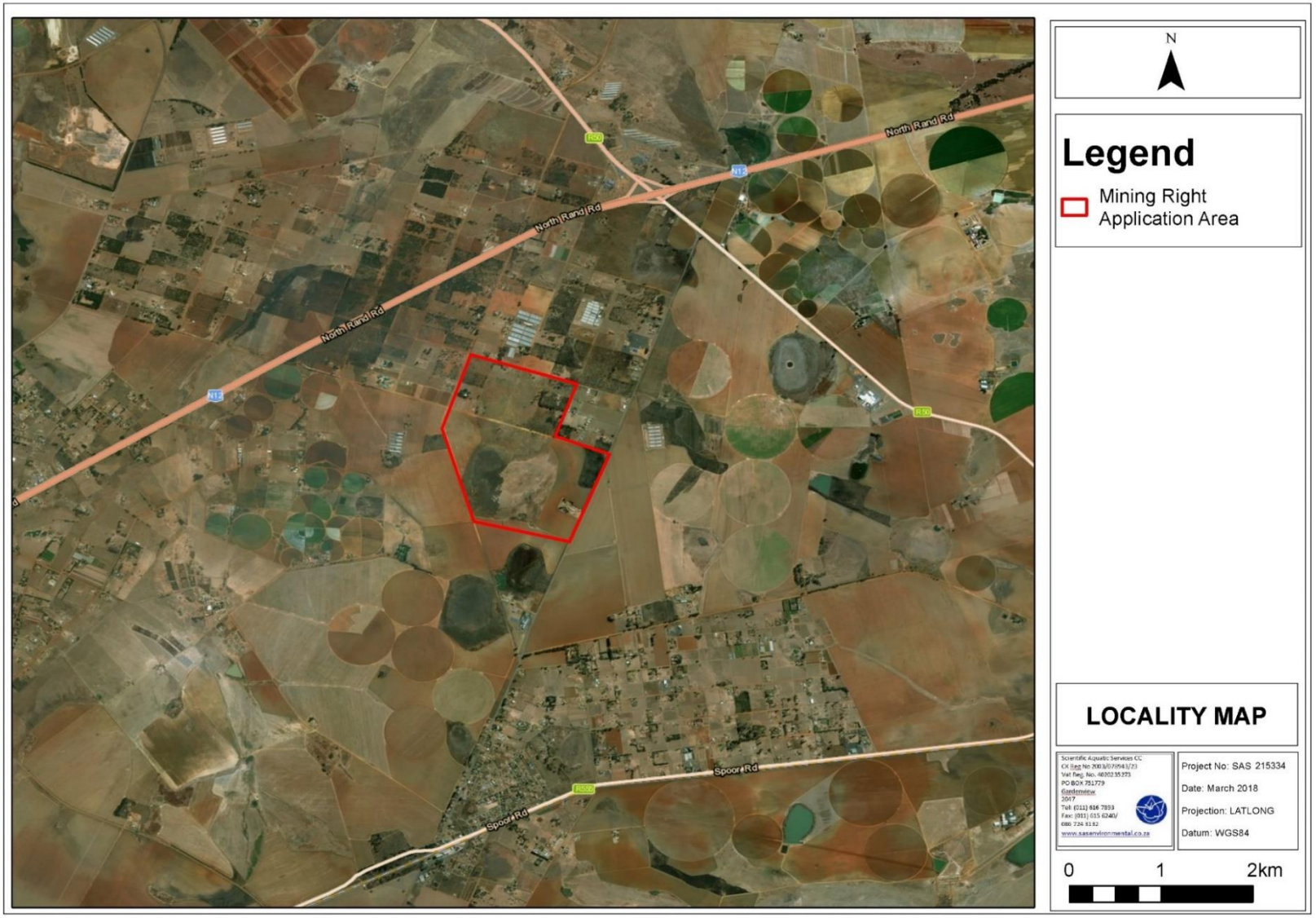


Figure 1: Digital satellite image depicting the location of the Rietkol MRA area in relation to surrounding areas.

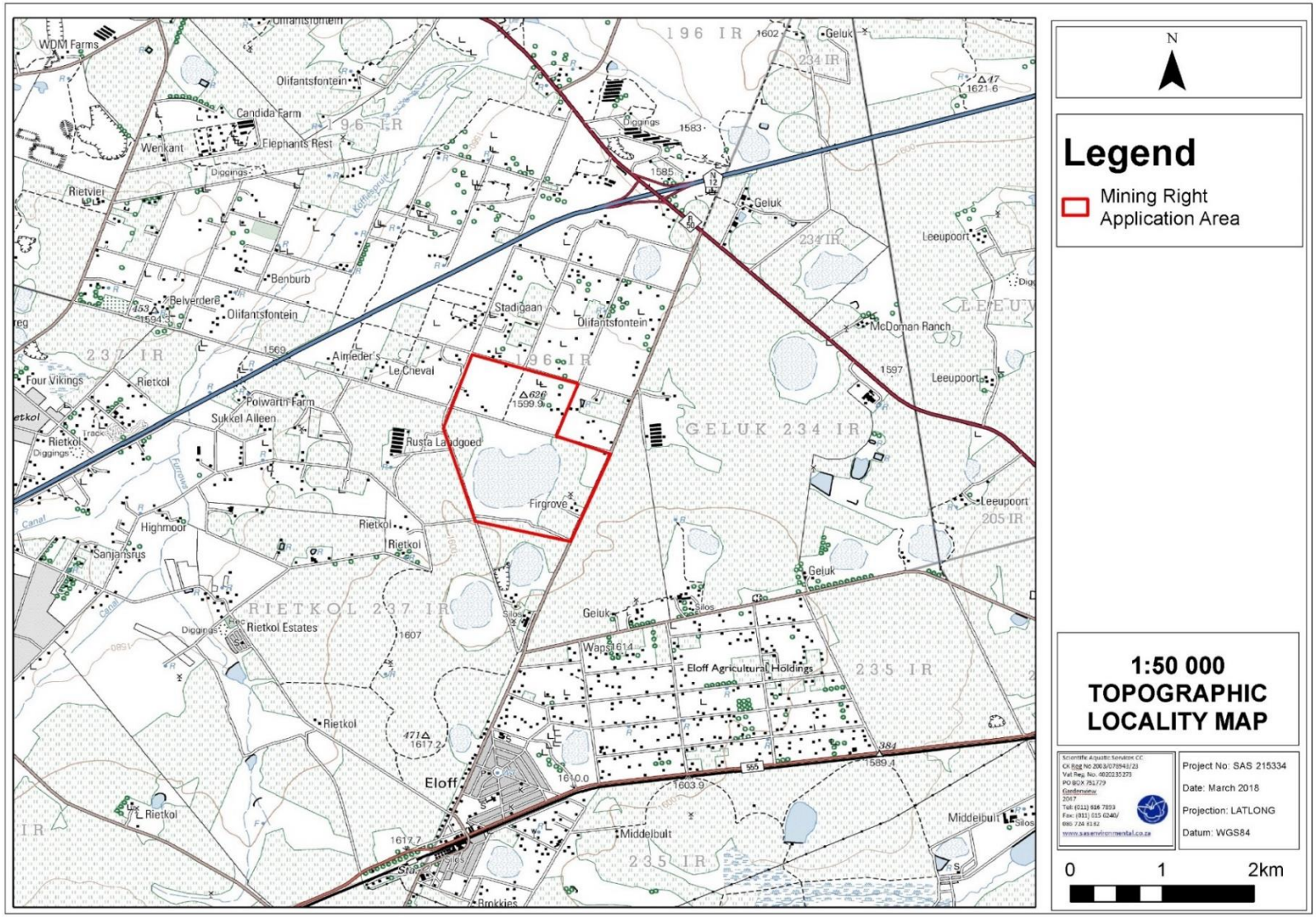


Figure 2: MRA area depicted on a 1:50 000 topographical map in relation to its surrounding area.

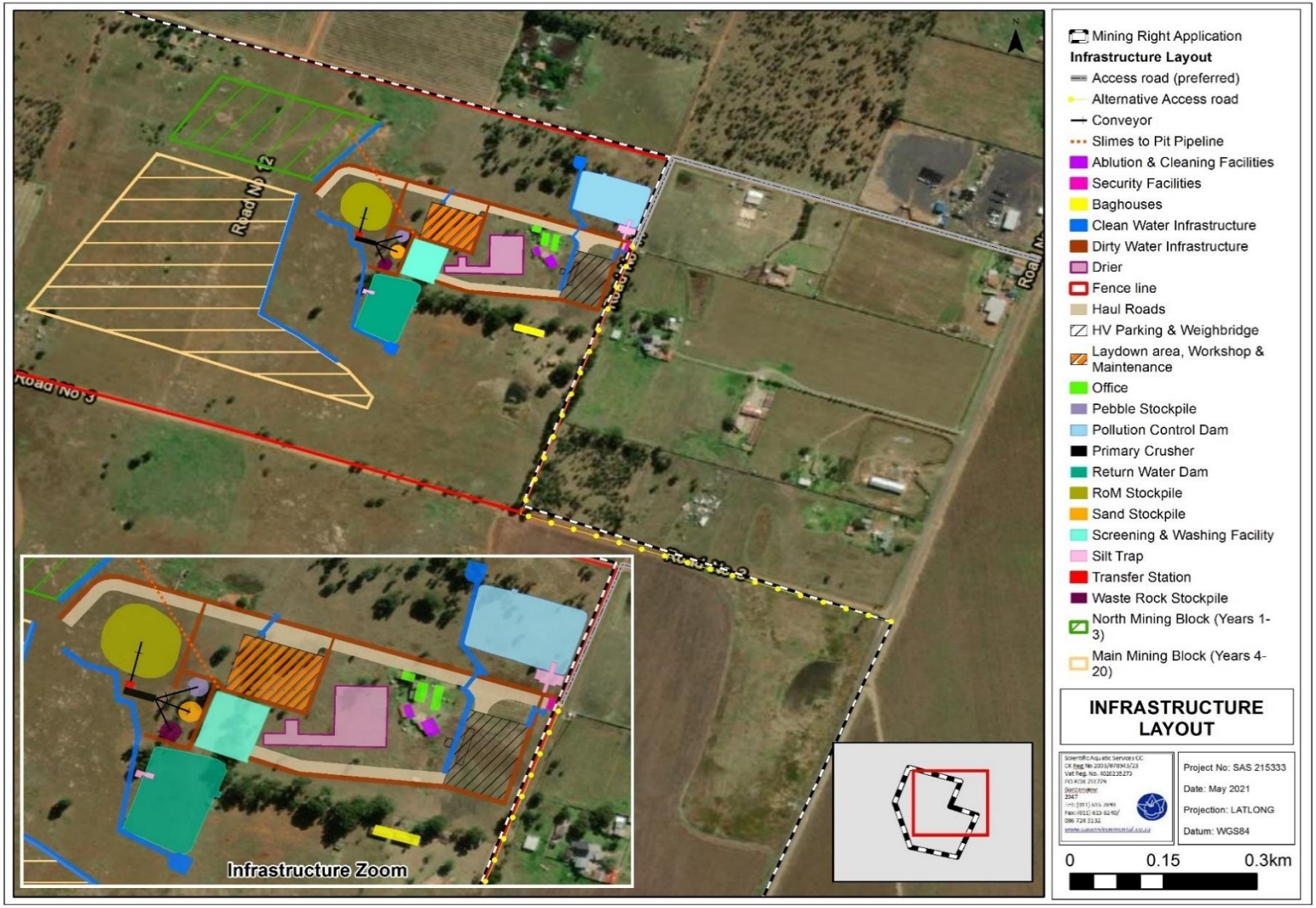


Figure 3: Proposed Infrastructure associated with the MRA area.

1.3 Terms of Reference and Scope of Work

The Environmental Authorisation process of the soil, land use and land capability assessment entailed the following aspects:

- As part of the desktop study various data sets were consulted which includes but not limited to: Soil and Terrain dataset (SOTER), land type and capability maps and soil 2001, to establish broad baseline conditions and sensitivity of study area both on environmental and agricultural perspective;
- Compile various maps depicting the on-site conditions based on desktop review of existing data;
- Classification of the climatic conditions occurring within the study area;
- Conduct a soil classification survey within the study area;
- Soil classification into soil forms according to the Taxonomic Soil Classification System for South Africa (1991);
- Identify restrictive soil properties on land capability under prevailing conditions;
- Identify and assess the potential impacts in relation to the proposed development using pre-defined impact assessment methodology; and
- Compile soil, land use and land capability report under current on-site conditions based on the field finding data.

1.4 Assumptions and Limitations

For the purpose of this assessment, the following assumptions and limitations are applicable:

- The soil survey conducted as part of the land capability assessment was restricted to the MRA area , which is considered adequate for the purpose of this investigation;
- Sampling by definition means that not all areas are assessed, and therefore some aspects of soil and land capability may have been overlooked in this assessment. However, it is the opinion of the professional specialist that this assessment was carried out with sufficient sampling and in sufficient detail to enable the proponent, the Environmental Assessment Practitioner (EAP) and the regulating authorities to make an informed decision regarding the proposed mining activities;
- Land Capability was classified according to current soil restrictions, with respect to prevailing climatic conditions on site; however, it is virtually impossible to achieve 100% purity in soil mapping, the delineated soil map units could include other soil type(s) as the boundaries between the mapped soils are not absolute but rather form a continuum and gradually change from one type to another. Soil mapping and the findings of this assessment were therefore inferred from extrapolations from individual observation points;

- Since soils occur in a continuum with infinite variances, it is often problematic to classify any given soils as one form, or another. For this reason, the classifications presented in this report are based on the "best fit" to the soil classification system of South Africa; and
- Soil fertility status was not considered a limitation, seeing as inherent nutrient deficiencies and/or toxicities would be rectified by appropriate liming and/or fertilization prior to cultivation.

2. METHOD OF ASSESSMENT

2.1 Literature and Database Review

A desktop study was compiled from various data sources including but not limited to the Agricultural Geo-Referenced Information System (AGIS) and other sources as listed under references.

2.2 Soil Classification and Sampling

Soil surveys were conducted on 16 February 2016 and 6 December 2016, where the identified soils within the MRA area were classified into soil forms according to the Taxonomic Soil Classification System for South Africa (1991). Subsurface soil observations were made using a manual hand auger in order to assess individual soil profiles, which entailed evaluating physical soil properties and prevailing limitations to various land uses. Relatively similar soil forms identified within uniform terrain units were grouped into map units, with respect to observed limitations.

2.3 Land Capability Classification

Agricultural potential is directly related to Land Capability, as measured on a scale of I to VIII, as presented in Table 1 below; with Classes I to III classified as prime agricultural land that is well suitable for annual cultivated crops. Whereas, Class IV soils may be cultivated under certain circumstances and management practices, whereas Land Classes V to VIII are not suitable to cultivation. Furthermore, the climate capability is also measured on a scale of 1 to 8, as illustrated in Table 2 below. The land capability rating is therefore adjusted accordingly, depending on the prevailing climatic conditions as indicated by the respective climate capability rating. The anticipated impacts of the proposed land use on soil and land capability were assessed in order to inform the necessary mitigation measures.

Table 1: Land Capability Classification (Smith, 2006).

Land Capability Class	Increased Intensity of Use									Land Capability Groups	Limitations
I	W	F	LG	MG	IG	LC	MC	IC	VIC	**Arable land**	No or few limitations
II	W	F	LG	MG	IG	LC	MC	IC			Slight limitations
III	W	F	LG	MG	IG	LC	MC	IC			Moderate limitations
IV	W	F	LG	MG	IG	LC					Severe limitations
V	W	F	LG	MG						**Grazing land**	Water course and land with wetness limitations
VI	W	F	LG	MG							Limitations preclude cultivation. Suitable for perennial vegetation
VII	W	F	LG								Very severe limitations. Suitable only for natural vegetation
VIII	W									**Wildlife**	Extremely severe limitations. Not suitable for grazing or afforestation.
W- Wildlife				MG- Moderate grazing						MC- Moderate cultivation	
F- Forestry				IG- Intensive grazing						IC- Intensive cultivation	
LG- Light grazing				LC- Light cultivation						VIC- Very intensive cultivation	

Table 2: Climate Capability Classification (Scotney et al., 1987).

Climate Capability Class	Limitation Rating	Description
C1	None to slight	Local climate is favourable for good yield for a wide range of adapted crops throughout the year.
C2	Slight	Local climate is favourable for good yield for a wide range of adapted crops and a year-round growing season. Moisture stress and lower temperatures increase risk and decrease yields relative to C1.
C3	Slight to moderate	Slightly restricted growing season due to the occurrence of low temperatures and frost. Good yield potential for a moderate range of adapted crops.
C4	Moderate	Moderately restricted growing season due to low temperatures and severe frost. Good yield potential for a moderate range of adapted crops but planting date options more limited than C3.
C5	Moderate to severe	Moderately restricted growing season due to low temperatures, frost and/or moisture stress. Suitable crops may be grown at risk of some yield loss.
C6	Severe	Moderately restricted growing season due to low temperatures, frost and/or moisture stress. Limited suitable crops for which frequently experience yield loss.
C7	Severe to very severe	Severely restricted choice of crops due to heat, cold and/or moisture stress.
C8	Very severe	Very severely restricted choice of crops due to heat and moisture stress. Suitable crops at high risk of yield loss.

The land potential assessment entails the combination of climatic, slope and soil condition characteristics to determine the agricultural land potential of the investigated area. The

classification of agricultural land potential and knowledge of the geographical distribution of agricultural viable land within an area of interest. This is of importance for making an informed decision about land use. Table 3 below presents the land potential classes, whilst Table 4 presents a description thereof, according to Guy and Smith (1998).

Table 3: Table of Land Potential Classes (Smith, 2006).

Land Capability Class	Climate Capability Class							
	C1	C2	C3	C4	C5	C6	C7	C8
I	L1	L1	L2	L2	L3	L3	L4	L4
II	L1	L2	L2	L3	L3	L4	L4	L5
III	L2	L2	L3	L3	L4	L4	L5	L6
IV	L2	L3	L3	L4	L4	L5	L5	L6
V	Vlei	Vlei	Vlei	Vlei	Vlei	Vlei	Vlei	Vlei
VI	L4	L4	L5	L5	L5	L6	L6	L7
VII	L5	L5	L6	L6	L7	L7	L7	L8
VIII	L6	L6	L7	L7	L8	L8	L8	L8

Table 4: The Land Capability Classes Description (Smith, 2006).

Land Potential	Description of Land Potential Class
L1	**Very high potential:** No limitations. Appropriate contour protection must be implemented and inspected.
L2	**High potential:** Very infrequent and/or minor limitations due to soil, slope, temperatures or rainfall. Appropriate contour protection must be implemented and inspected.
L3	**Good potential:** Infrequent and/or moderate limitations due to soil, slope, temperatures or rainfall. Appropriate contour protection must be implemented and inspected.
L4	**Moderate potential:** Moderately regular and/or severe to moderate limitations due to soil, slope, temperature or rainfall. Appropriate permission is required before ploughing virgin land.
L5	**Restricted potential:** Regular and/or moderate to severe limitations due to soil, slope, temperature or rainfall.
L6	**Very restricted potential:** Regular and/or severe limitations due to soil, slope, temperature or rainfall. Non-arable.
L7	**Low potential:** Severe limitations due to soil, slope, temperature or rainfall. Non-arable.
L8	**Very low potential:** Very severe limitations due to soil, slope, temperature or rainfall. Non-arable.

2.4 Consideration of DEA Screening Tool

The Agricultural Agro-Ecosystem Assessment protocol provides the criteria for the assessment and reporting of impacts on agricultural resources for activities requiring environmental authorisation. The assessment requirements of this protocol are associated with a level of environmental sensitivity determined by the national web-based environmental screening tool which for agricultural resources is based on the most recent land capability evaluation values as provided by the Department of Agriculture, Forestry and Fisheries. The national web-based environmental screening tool can be accessed at: https://screening.environment.gov.za/screeningtool. The environmental screening for the MRA area was deemed very high for the Agricultural Theme.

The main purpose of the Agricultural Agro-Ecosystem Assessment is to ensure that the sensitivity of the site to the proposed land use change (from present state to proposed construction and mining related activities) is sufficiently considered. The information provided in this report aims to enable the Competent Authority to come to a sound conclusion on the impact of the proposed construction and mining related activities on the food production potential of the site.

To meet this objective, site sensitivity verification must be conducted of which the results must meet the following objectives:

- It must confirm or dispute the current land use and the environmental sensitivity as was indicated by the National Environmental Screening Tool;
- It must contain proof (e.g., photographs) of the current land use and environmental sensitivity pertaining to the study area;
- All data and conclusions are submitted together with the main report for the proposed construction and mining related activities;
- It must indicate whether or not the proposed construction and mining related activities will have an unacceptable impact on the agricultural production capability of the site, and in the event where it does, whether such a negative impact is outweighed by the positive impact of the proposed development on agricultural resources; and
- The report is prepared in accordance with the requirements of the Environmental Impact Assessment Regulations.

The report is thus compiled in a manner that meets the minimum report content requirements for impacts on agricultural resources by the proposed construction and mining related activities.

3. ASSESSMENT RESULTS

3.1 Desktop Assessment Results

The desktop assessment results were obtained from various data sources including but not limited to the Agricultural Geo-Referenced Information System (AGIS) and other sources as listed under references.

- The Mpumalanga Biodiversity Sector Plan (MBSP, 2014) indicates that the MRA area is dominated by natural areas, with some occurrence of moderately and heavily modified areas, as presented in Figure 4 below.
- According to the Agricultural Research Council - Institute for Soil Climate and Water (ARC-ISCW) climatic data records, the regional mean annual precipitation (MAP) ranges between 601-800 mm per annum for the surrounding area.

- According to the 1:1 000 000 Soil and Terrain (SOTER) database for South Africa, the prevailing soils are derived from sandstone, greywacke, and arkose parent rock materials (Figure 5).
- The SOTER database further indicates that the soils within the MRA area are classified as plinthic Acrisols (ACp) as illustrated in Figure 6 below. According to the World Reference Base (WRB) soil classification, these soils are typically strongly weathered acid soils, as implied by the Latin connotation “acer” meaning very acid (IUSS Working Group, 2014).
- The natural soil pH is estimated to range between 5.5-6.4 within the study area, as interpolated from topsoil pH values obtained from the National Soil Profile Database (AGIS database). This further suggests that the soils are anticipated to be naturally slightly acidic within the MRA area.
- According to the AGIS database, the MRA area is classified to be of high potential arable (Class II) land capability, as presented in Figure 7; which implies that the site has predominantly high agricultural potential for cultivated crops.
- According to the AGIS database, the livestock grazing capacity within the MRA area is classified as a transformed rangeland (Morgenthal *et al.*, 2005), as presented in Figure 8. This is intuitively inferred to be likely attributed to historic anthropogenic activities including cultivation and overgrazing, based on observations during the *ground truthing* assessment.

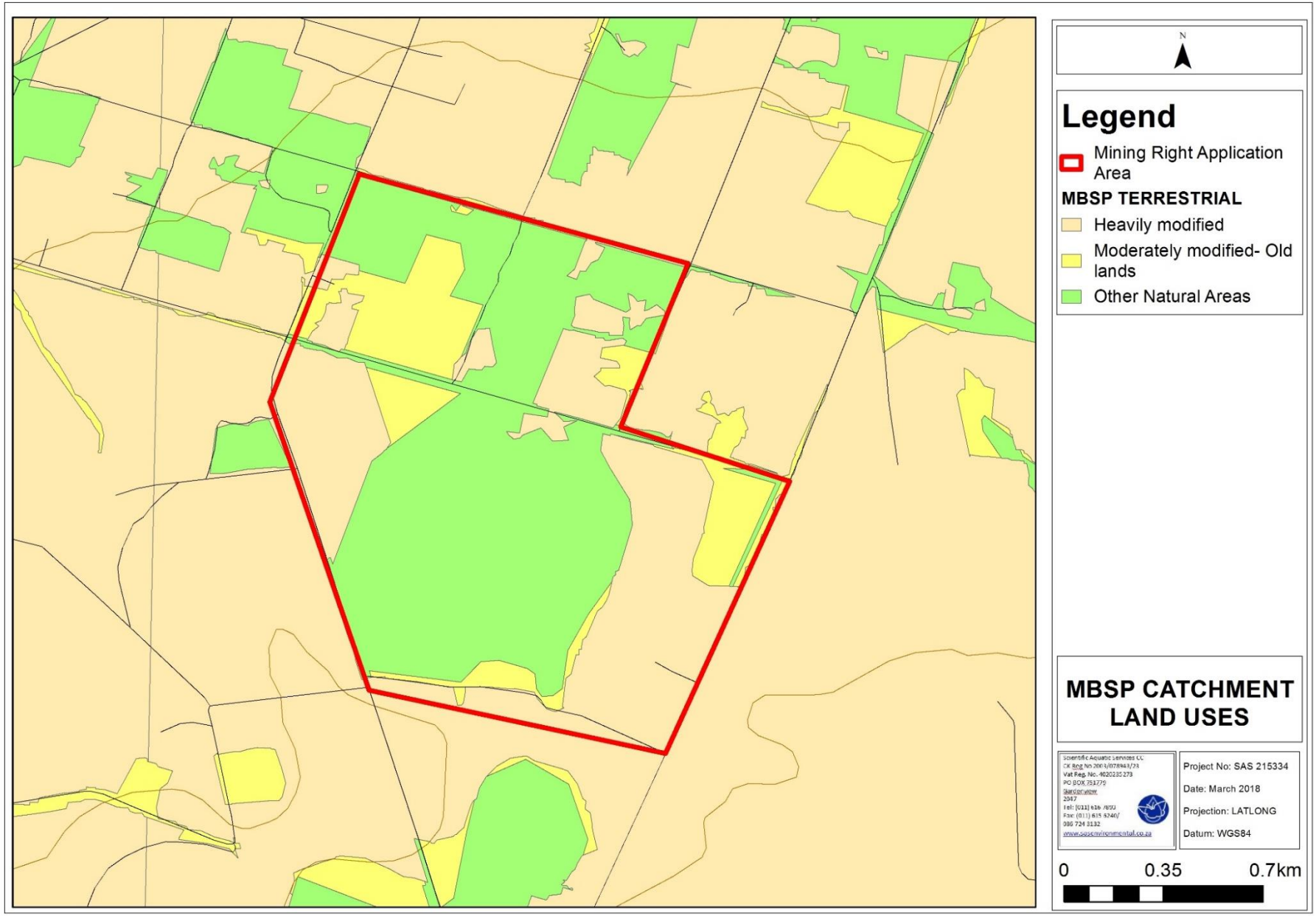


Figure 4: Existing land use impact in the vicinity of the MRA area according to the MBSP.

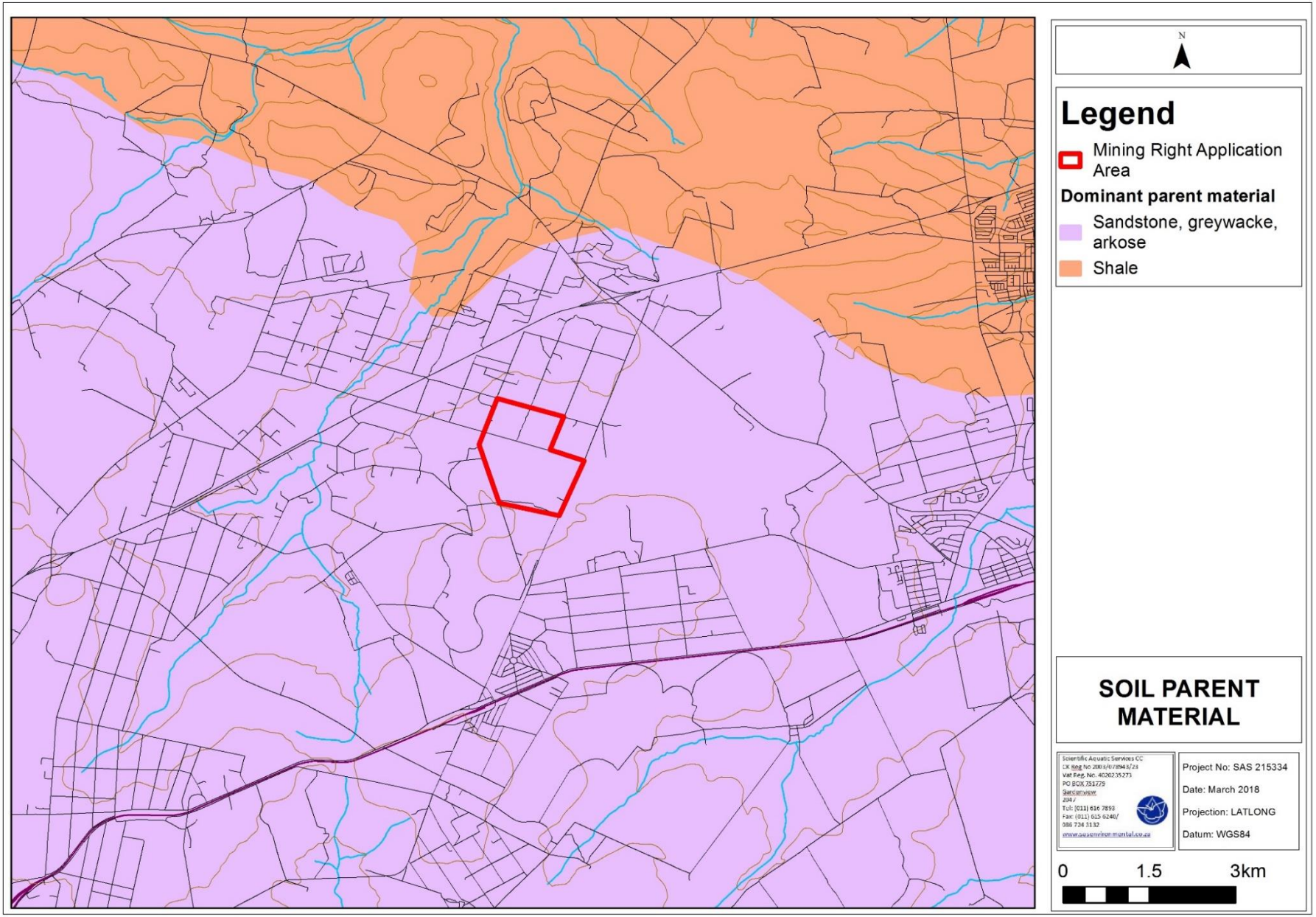


Figure 5: Soil parent materials in the vicinity of the Rietkol MRA area.

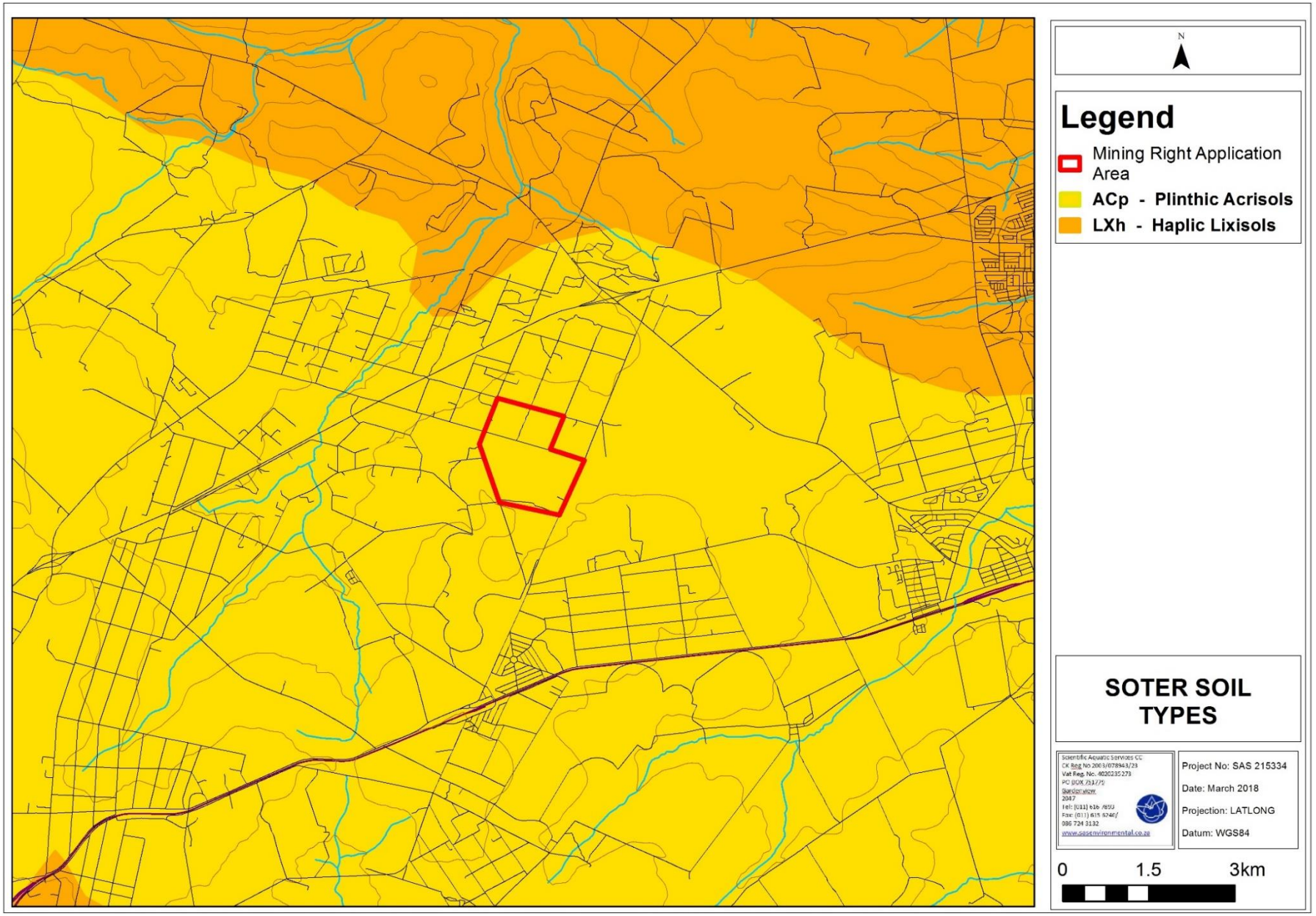


Figure 6: Soil types in the vicinity of the Rietkol MRA area.

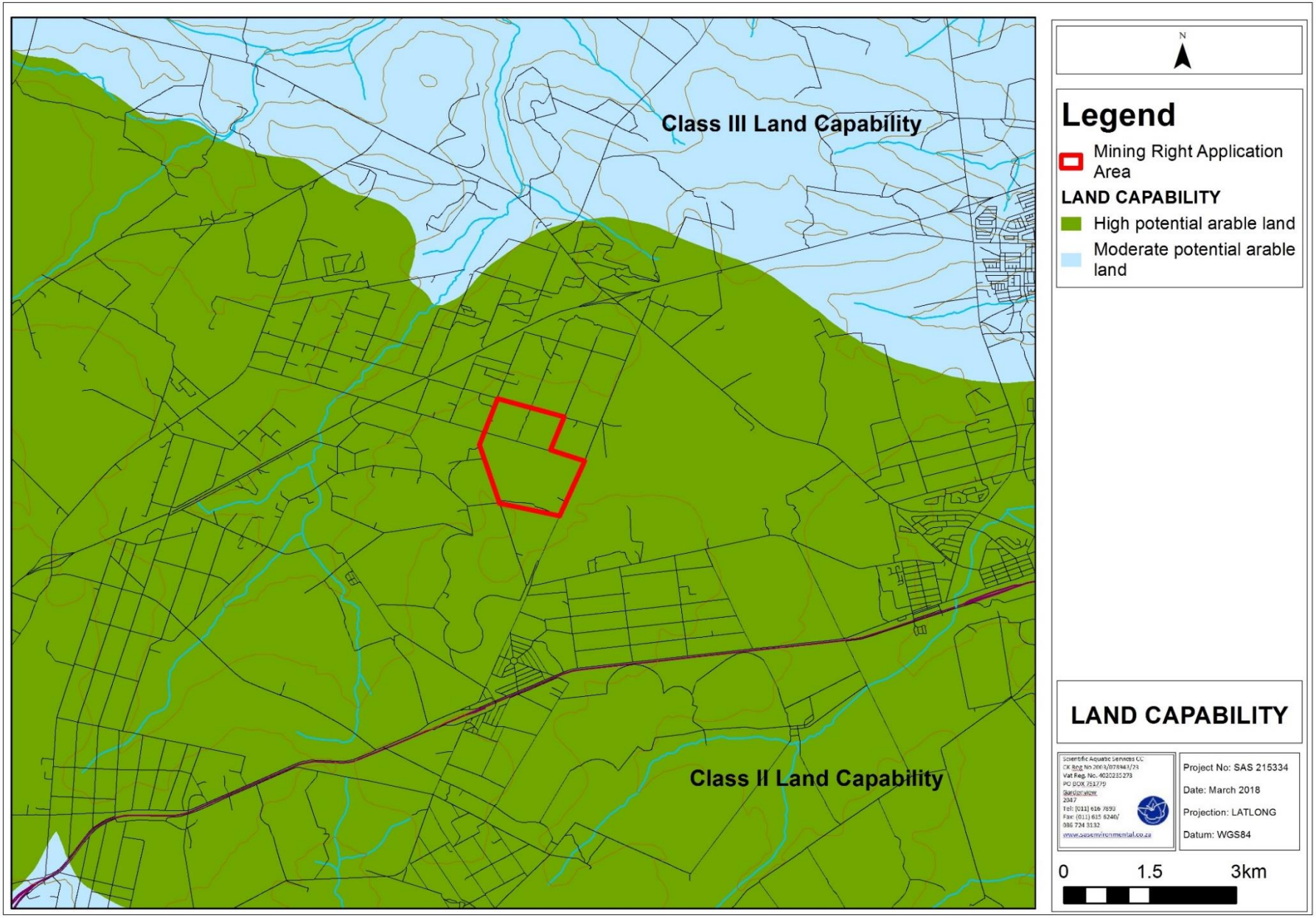


Figure 7: Land capability of the prevailing soils in the vicinity of the Rietkol MRA area.

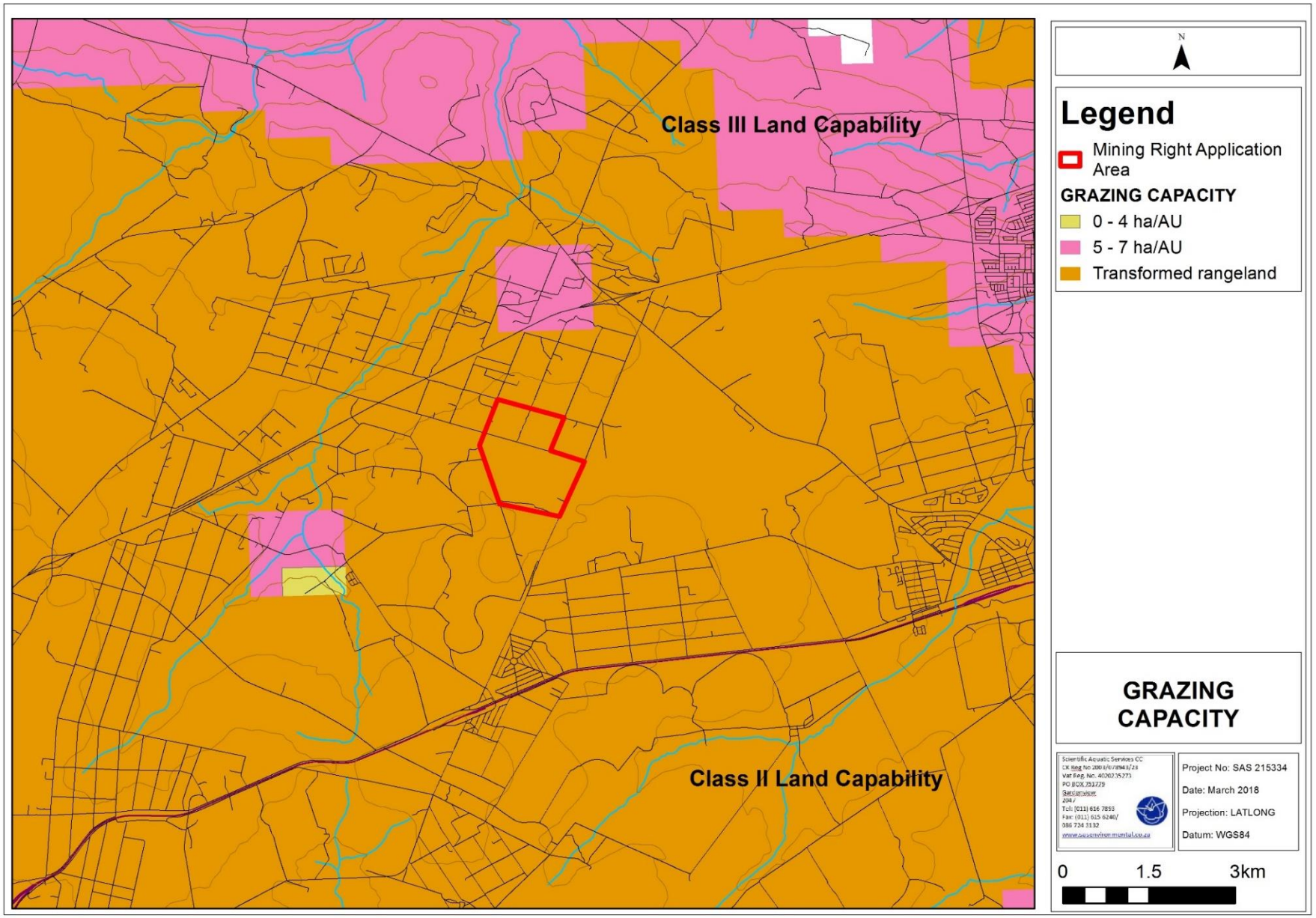


Figure 8: Grazing capacity of the prevailing soils in the vicinity of the Rietkol MRA area.

3.2 In-situ Assessment Results

3.2.1 Historic and Current Land Use

The dominant land use in the vicinity of the MRA include:

- Agriculture (animal and crop farming);
- Grazing land and open veld;
- Cultivated orchards
- Flower and vegetable tunnels; and
- Residential areas

Current land use activities within the investigated study area livestock grazing and cultivated agriculture (i.e. Mealies and orchards), as observed during the site assessment. Sandstone outcrops were observed where the bedrock is exposed on the ground surface around the crest (hilltop) landscape position. This is indicative of intense erosion likely attributed to historic land uses, particularly overgrazing. Abandoned buildings and other residual concrete structures from historic infrastructure were also observed within the MRA area. Such area and other existing buildings were classified as Witbank (Anthrosols) (man-made soil deposit) and delineated as equivalent to the observed rocky outcrop areas. Rocky outcrop and built-up (including abandoned historic infrastructure) areas collectively constitute approximately 31.2 hectares (ha) i.e. 14.1% of the MRA area.

3.2.2 Dominant Soil Types

The dominant soil types included Hutton (Hu), Clovelly (Cv), Mispah/Glenrosa/Dresden (Ms/Gs/Dr), Katspruit (ka) and Pinedene (Pn) soil forms identified within the investigated MRA area, as illustrated in Tables 1-5 for each soil map unit. The MRA area is dominated by Hutton and Clovelly soil forms, which collectively constitute approximately 92.5 ha, amounting to 41.8% of the MRA area. Katspruit soils which are associated with wetland resources constitute approximately 52.8 ha, which amounts to 23%. Rocky outcrops constitute approximately 31.2 ha, equating to 14.1%, whilst the shallow Mispah/Glenrosa/Dresden soil forms occupy approximately 15.1 ha, which amounts to 6.8% of the MRA area. The remainder of the study area is occupied by residential properties, Witbank (Anthrosols) as well as Westleigh/Avalon and Pinedene soil forms, as presented in Figure 9.

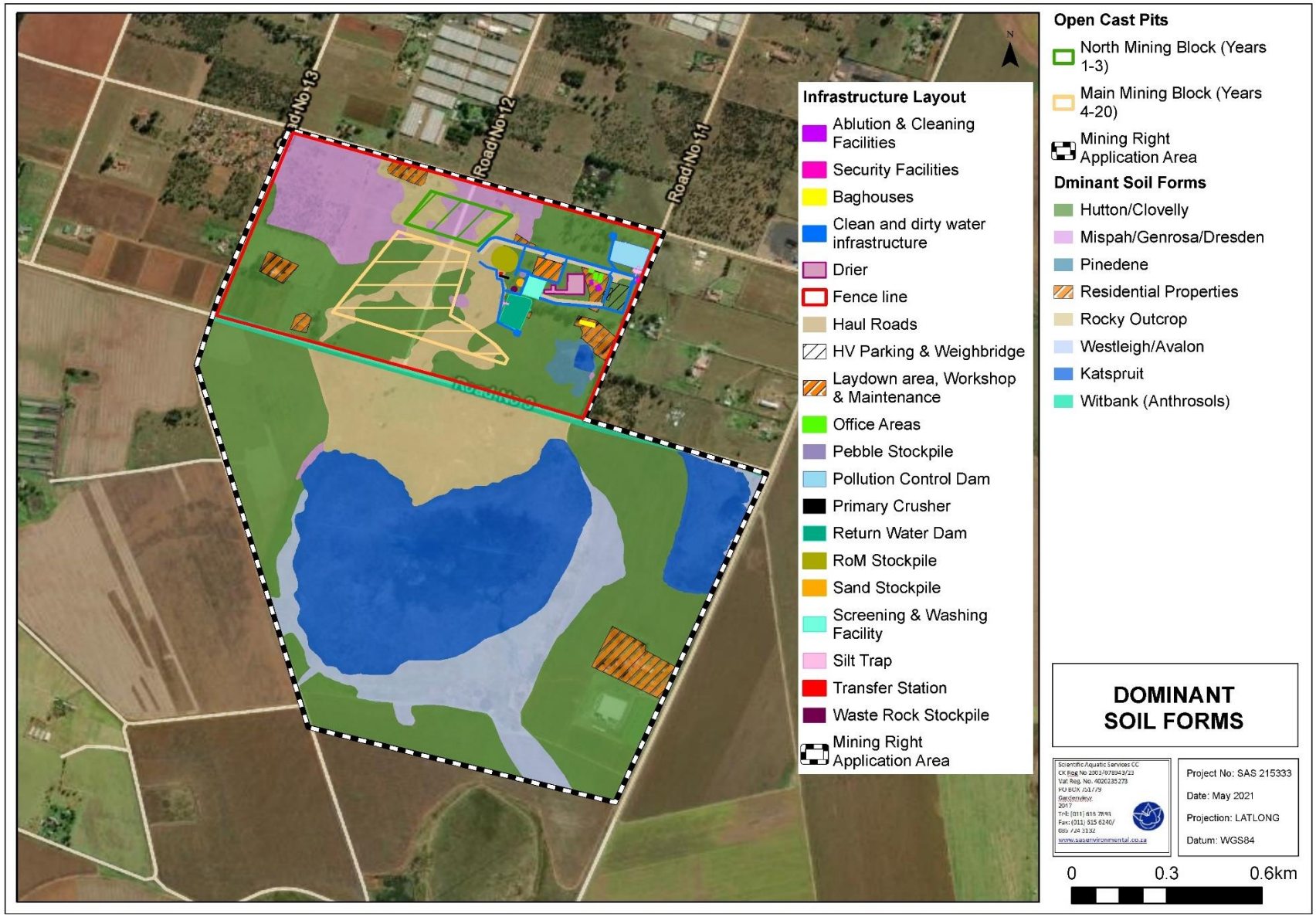


Figure 9: Identified soil forms within the Rietkol MRA area.

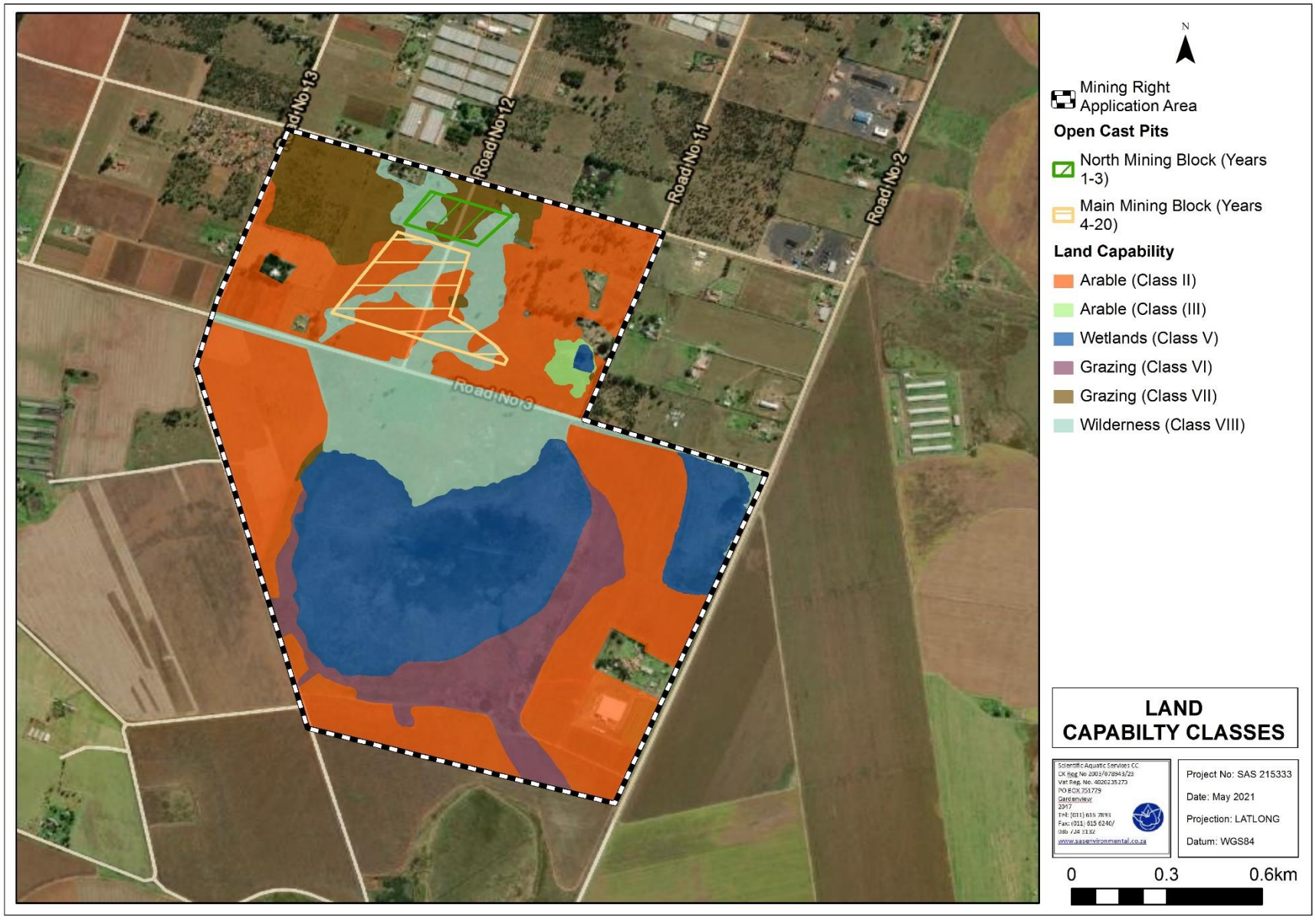


Figure 10: Land capability classification within the Rietkol MRA area.

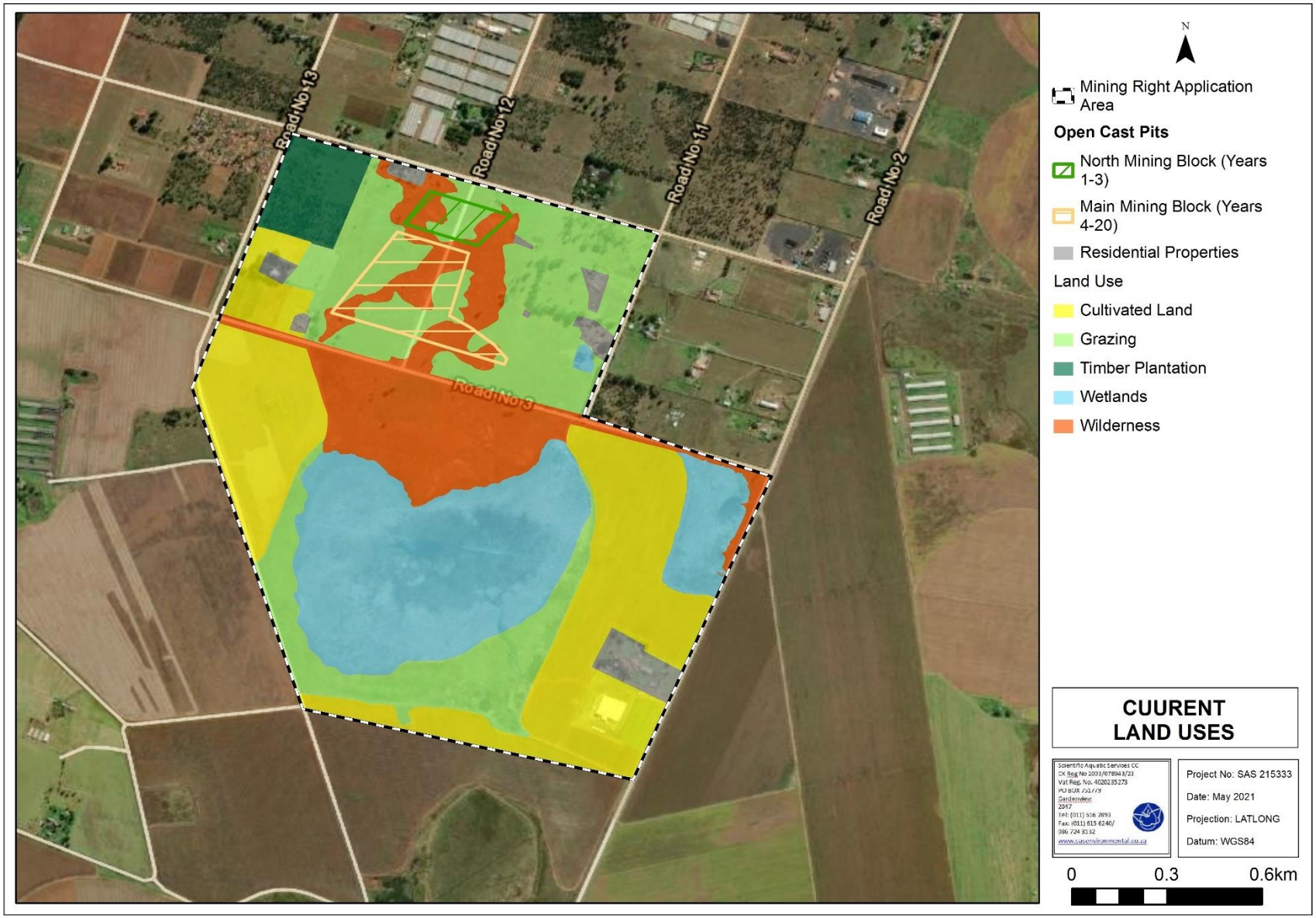


Figure 11: Current land use within the Rietkol MRA area.

Table 5: Summary discussion of the identified Hutton and Clovelly (Hu/Cv) soil forms within the MRA area.

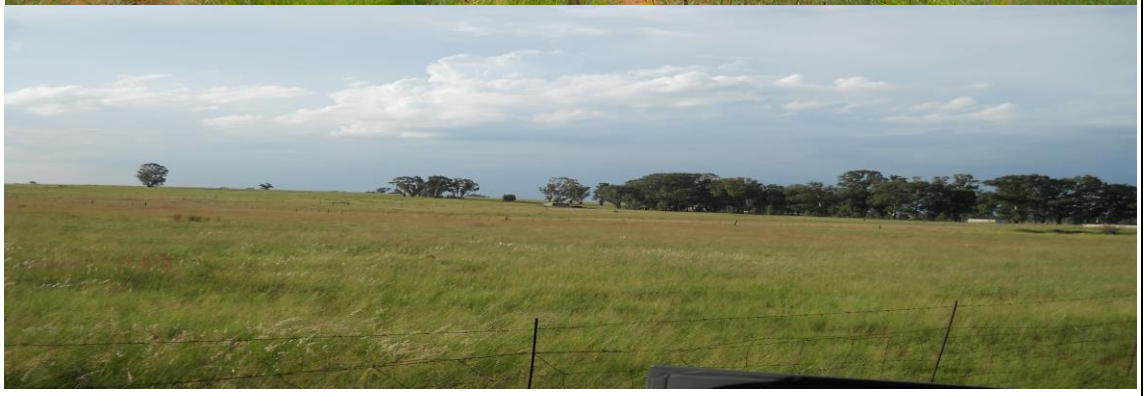
Soil Map Unit: Hutton/Clovelly (Hu/Cv)		
 		 
Photograph notes	View of the landscape position (TMU) where the Hutton and Clovelly soil forms were identified.	View of the identified Hu and Cv soil forms
Terrain Morphological Unit (TMU)	Gently sloping foot slopes and flat areas of < 1% gradient	
Diagnostic Horizon Sequence	0-15 cm: Orthic A 15-80 cm: Yellow-brown apedal B / Red apedal B ≥ 80 unspecified	
Areal Extent	92.5 ha; which constitutes ≈ 41.8% of the MRA area.	
Physical Limitations	None; sufficient depth for most cultivated crops and good drainage characteristics.	

Table 6: Summary discussion of the identified Mispah/Glenrosa/Dresden (Ms/Gs/Dr) soil forms within the MRA area.

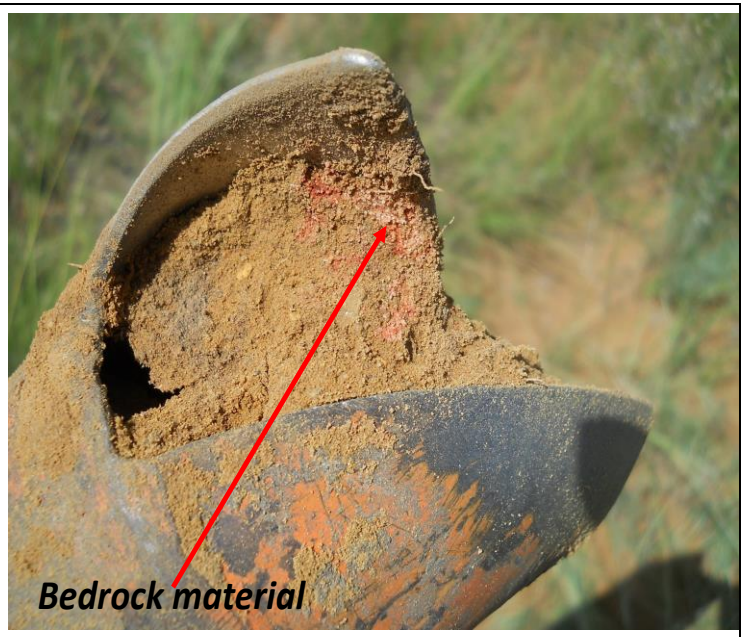
Soil Map Unit Mispah/Glenrosa/Dresden (Ms/Gs/Dr)		
		
Photograph notes	View of the landscape position (TMU) where the Mispah/Glenrosa/Dresden soil forms were identified	View of the encountered bedrock material at shallow ≈15cm depth
Terrain Morphological Unit (TMU)	Relatively steep slopes of ≈ 3.5% gradient and crest (hilltop) landscape positions.	
Diagnostic Horizon Sequence	0-15 cm: Orthic A 15-80 cm: Hard rock / Lithocutanic B / hard plinthic B	
Areal Extent	15.1 ha; which constitutes ≈ 6.8% of the MRA area.	
Physical Limitations	Comprises of thin shallow soils of approximately 15 cm loamy sand underlain by an indurated rock bedrock, with very shallow effective depth. This group of soils also comprises of Witbank (anthrosols) (man-made soil deposits), including the residual concrete slabs, buried building rubble, and stockpiles from the demolished buildings of the former land use infrastructure.	

Table 7: Summary discussion of the identified rocky outcrop areas and Witbank (anthrosols) within the MRA area.

Soil Map Unit: Rocky outcrop and Witbank (Witbank (anthrosols)) and residential areas		
		
Photograph notes	View of the landscape position (TMU) where the rocky outcrops and Witbank (anthrosols) were identified.	View of the residual concrete structures from former land use infrastructure, classified as Witbank (anthrosols).
Terrain Morphological Unit (TMU)	Gently sloping land and crest (hilltop) positions.	
Diagnostic Horizon Sequence	No recognizable residual diagnostic soil horizon features. These areas were likely Mispah/Glenrosa/Dresden soils forms in their undisturbed state prior to loss of topsoil, as inferred from their landscape position on higher lying areas and shallow bedrock encountered in the vicinity of these areas.	
Areal Extent	Approximately 31.2 ha is comprising of rocky outcrop areas and ≈ 3.7 ha of Witbank (anthrosols) and residential properties ≈ 6 ha; collectively amounting to 18.5% of the MRA area.	
Physical Limitations	The rocky outcrop areas comprise of indurated bedrock exposed on the ground surface with no overlying topsoil. Whereas the Witbank (anthrosols) (man-made soil deposits) soil group comprises of built-up residential properties as well as residual non-soil features e.g. concrete slabs from the demolished buildings of the former land use infrastructure.	

Table 8: Summary discussion of the identified Pinedene and Fernwood (Pn/Fw) soil forms within the MRA area.

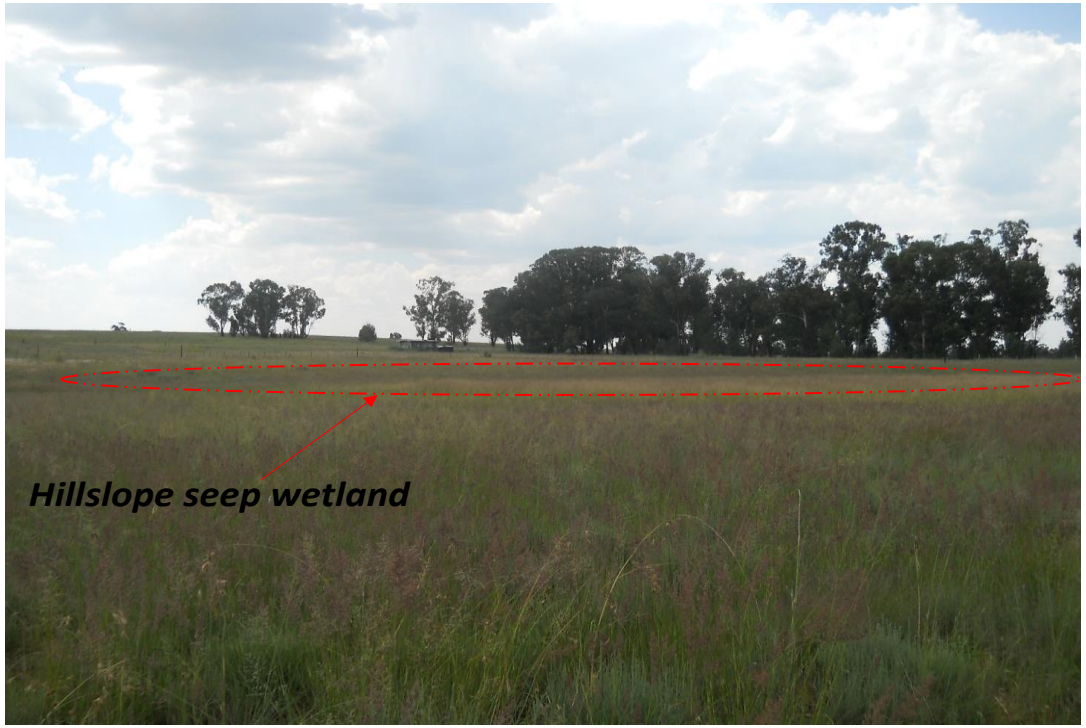
Soil Map Unit: Pinedene and Fernwood (Pn/Fw) soil forms.		
		
Photograph notes	View of the hillslope seep wetland located on the foot-slope TMU where the Pinedene and Fernwood soil forms were identified.	View of representative pictures of the identified Pinedene and Fernwood soil forms
Terrain Morphological Unit (TMU)	Gently sloping, slow draining, concave-shaped, foot-slope landscape position.	
Diagnostic Horizon Sequence	0-8 cm: Orthic A 8-28 cm: Yellow-brown apedal B / E horizon ≥ 28 cm: Unspecified material with signs of wetness	
Areal Extent	1.4 ha; which constitutes approximately 0.6% of the MRA area.	
Physical Limitations	Classified as characteristic wetland soils with slight to moderately impaired drainage, as evidenced by discernible mottling. This implies that sseasonal waterlogging is the main limitation.	

Table 9: Summary discussion of the identified Westleigh/Avalon soil forms within the MRA area.

Soil Map Unit: Westleigh/Avalon (We/Av) soil forms		
		  
Photograph notes	View of the hillslope seep wetland located on the foot-slope TMU where the Westleigh/Avalon soil forms were identified.	View of representative pictures of the identified Westleigh and Avalon soil forms.
Terrain Morphological Unit (TMU)	Flat landscape position.	
Diagnostic Horizon Sequence	0-18 cm: Orthic A ≥ 18 cm: Yellow brown Apedal B/Soft Plinthic B	
Areal Extent	20.5 ha; which constitutes approximately 9.3 % of the MRA area.	
Physical Limitations	These soils are located within the inundated impoundment features of the hillslope seep wetland, therefore severe waterlogging is a major land use limitation for these soils.	

4. IMPACT/RISK ASSESSMENT AND MITIGATION MEASURES

The proposed mining activities and associated surface infrastructure are anticipated to directly impact on the land capability of the prevailing soils, particularly where the proposed mining blocks traverse through high land capability soils. This may result in long-term withdrawal of land particularly from arable agricultural production as well as potential grazing opportunities. Thus, the land capability impact assessment was undertaken on all aspects of soil and capability likely to be affected by the proposed project. The sections below present the results of the findings per identified risk/ impact for the proposed mining activities and associated surface infrastructure.

Activities which are likely to negatively affect the soil and land capability have been identified, and the impacts include, but not limited to, the following:

- Soil erosion and dust generation resulting from cleared and disturbed areas, leading to loss of soils for potential plant growth;
- Soil compaction resulting from increased traffic of mining equipment;
- Loss of soil depth and volume due to excavation associated with mining activities; and
- Contamination of soil resources resulting from accidental spillage of chemicals and hazardous material, leading to altered soil chemistry; and
- Loss of high potential agricultural soils.

4.1 Impact source (Activity): Vegetation clearing

4.1.1 Impact: Soil erosion and dust emission

Soils with a high clay content have a high-water retention capacity are typically less prone to erosion in comparison to sandy textured soils, which in contrast are more susceptible to erosion. However, the parameters determining the extent and severity of soil erosion are highly complex, with water and wind as the main geomorphic agents, and soil erosion is largely dependent on land use and soil management and is generally accelerated by human activities. The proposed mining project is located on a relatively flat and gently sloping terrain. This largely limits the erosion hazard, and the physical soil properties therefore take dominance over slope gradient as a determining criterion for anticipated erosion risk.

The identified soils will become more vulnerable to erosion once the vegetation is cleared for construction activities, and the soils will inevitably be exposed to wind and stormwater. As

such, the significance of this impact is anticipated to be medium low prior to mitigation and relatively low post mitigation and, as illustrated on the impact rating table below.

4.2 Impact Source (Activity): Construction, Mining Related Activities and Vehicle Traffic

4.2.1 Impact: Soil compaction and dust emission

Heavy equipment traffic during construction and mining related activities is anticipated to cause some soil compaction, particularly for Hutton/Clovelly soils. However, rocky outcrop and shallow soils of Dresden/Mispah and Dresden are anticipated to be less impaired, attributable to the relatively shallow bedrock which offers resistance to compaction.

4.3 Impact Source (Activity): Accidental Spills and/or Leaks of Hazardous Chemicals

4.3.1 Impact: Potential Soil Contamination

All the identified soils are considered to be equally predisposed to potential contamination, as contamination sources are generally unpredictable and often occur as incidental spills or leak during mining activities. The significance of soil contamination is considered to be medium-high for all identified soils, largely depending on the nature, volume and/or concentration of the contaminant of concern. Therefore, strict spill management protocols and activity specific Environmental Management Programme (EMP) guidelines should be adhered to during the mining related activities.

4.4 Impact source (Activity): Soil Excavation

4.4.1 Impact: Loss soil depth and volume

The proposed open cast mining is anticipated to have a significant impact on soil depth and volume since complete rehabilitation will not be possible, as most of the material will be sold as product. The main block will be left partly open, thus the impact significance is regarded as moderately high.

4.5 Impact source (Activity): Miscellaneous Mining Related activities

4.5.1 Impact: Loss of Agricultural Land Capability

The proposed open cast mining and the associated surface infrastructure are not anticipated to result in significant loss of agricultural land capability due to the limited nature in extent of the project and since the majority of the mining blocks are underlain by soil resources which are not considered prime agricultural soils but rather soils capable of supporting grazing and wildlife/wilderness. Of the 92.5 (41.8 %) ha of prime agricultural soils (Hutton/Clovelly) within the MRA area;

- 9.2 ha will be affected by the proposed surface infrastructure;
- 5.2 ha will be affected by the main mining block; and
- None will be affected by the north mining block.

Therefore, a total of 14.4 ha of prime agricultural soils is anticipated to be affected by the proposed mining project, however this can be reduced if mitigation measures as well as recommendations outlined in section 6 of this document are considered. The disturbance of Hutton/Clovelly soils is unavoidable, however the impact on these soil resources will be limited to the mining and infrastructure footprint area.

Table 10: Summary of the Risk Assessment of the proposed Rietkol Mining Project on the wetlands located within the MRA area

ID	Environmental Aspect	Potential Impact	Nature of Impact	Duration	Extent	Probability	Intensity	Weighting factor	Impact Significance	Significant Points	Proposed Mitigation measures	Mitigation Efficiency	Impact Significance
1	Vegetation clearing within the proposed mining and infrastructure areas as part of site preparation prior to commencement mining and related of activities	*Soil erosion and dust generation as a result of vegetation clearing within the proposed mining areas	Negative	Long Term	Site specific	Definite	Medium	Medium	Low to Medium	36	*The footprint of the proposed infrastructure area should be clearly demarcated to restrict vegetation clearing activities within the infrastructure footprint as far as practically possible; *Bare soils can be regularly dampened with water to suppress dust during the construction phase, especially when strong wind conditions are predicted according to the local weather forecast; *All disturbed areas adjacent to the infrastructural and open cast areas can be re-vegetated with an indigenous grass mix, if necessary, to re-establish a protective cover, in order to minimise soil erosion and dust emission; *Vegetation clearance and commencement of construction activities can be scheduled to coincide with low rainfall conditions when the erosive stormwater and wind are anticipated to be low; and *Temporary erosion control measures may be used to protect the disturbed soils during the construction phase until adequate vegetation has established.	Medium to high	14.4 Low
2		* Soil compaction resulting from movement and traffic of mining and construction vehicles	Negative	Long Term	Site specific	probable	Medium	Medium	Low to Medium	33	*Vegetation clearance and commencement of construction activities can be scheduled to coincide with low rainfall conditions when soil moisture is anticipated to be relatively low, such that the soils are less prone to compaction *Compacted soils adjacent to the mining blocks and associated infrastructure footprint can be lightly ripped to at least 25 cm below ground surface to alleviate compaction prior to re-vegetation	Medium to high	12 Low

ID	Environmental Aspect	Potential Impact	Nature of Impact	Duration	Extent	Probability	Intensity	Weighting factor	Impact Significance	Significant Points	Proposed Mitigation measures	Mitigation Efficiency	Impact Significance
3	Site preparation prior to construction of activities related to the proposed surface infrastructure and open cast mining block areas	*Accidental spills and/or leaks of hazardous chemicals spilled from breakdowns of mining equipment	Negative	Temporary	Local	Probable	High	Medium	Low	20	* Contamination prevention measures should be addressed in the Environmental Management Programme (EMP) for the proposed development, and this should be always implemented and made available and accessible to the contractors, construction and mining crew conducting the works on site for reference; and * A spill prevention and emergency spill response plan, as well as dust suppression, and fire prevention plans should also be compiled to guide the construction and mining works; *An emergency response contingency plan should be put in place to address clean-up measures should a spill and/or a leak occur, as well as preventative measures to prevent ingress.	Low to Medium	16 Low
4	Excavation and removal of topsoil from the proposed open cast mining blocks and infrastructure areas	Topsoil removal and the creation of temporary stockpiles leading to loss of natural topography, soil depth, soil volume and alteration of natural drainage pattern	Negative	Long Term	Site Specific	Highly Probable	High	Medium	Medium	56	*Prevent mixing of high quality topsoil [A (0 - 30 cm) and B (30cm – parent material) horizons] with low quality underlying material to ensure sufficient volumes of high quality soil for rehabilitation. *Separate stripping, stockpiling and replacing of soil horizons [A (0 - 30 cm) and B (30cm – parent material)] in the original natural sequence to combat hardsetting and compaction, and maintain soil fertility; *Stockpiles should be revegetated to establish a vegetation cover as an erosion control measure. These stockpiles should also be kept alien vegetation free at all times to prevent loss of soil quality; *Temporary berms can be installed, if necessary, around stockpile areas whilst vegetation cover has not established to avoid soil loss through erosion; and *The recovered soils should be re-used to rehabilitate the mine footprint following mine closure.	Medium	33,6 Low to medium

ID	Environmental Aspect	Potential Impact	Nature of Impact	Duration	Extent	Probability	Intensity	Weighting factor	Impact Significance	Significant Points	Proposed Mitigation measures	Mitigation Efficiency	Impact Significance
5		Loss of high agricultural potential soils	Cumulative Negative	Long Term	Local	Definite	High	Medium to High	Medium to high	65	*Direct surface disturbance of the identified high agricultural potential soils (i.e. Hutton and Clovelly soil forms) must be avoided where possible to minimise since they are considered prime agricultural soils; *During the decommissioning phase the footprint should be thoroughly cleaned and all building material should be removed to a suitable disposal facility; *The footprint should be ripped to alleviate compaction; *Stored topsoil should be replaced (if any) and the footprint graded to a smooth surface; *The topsoil should be ameliorated according to soil chemical analysis and monitoring data. The soil fertility status should be determined by soil chemical analysis after levelling (before seeding/re-vegetation. Soil amelioration should be done according soil analyses as recommended by a soil specialist, in order to correct the pH and nutrition status before revegetation; *The footprint should be re-vegetated with a grass seed mixture as soon as possible, preferably in spring and early summer to stabilize the soil and prevent soil loss during the rainy season; and *A short-term fertilizer program should be implemented based on the findings of the soil chemical status after the first year in order to maintain the fertility status Fertility treatment should take place for a maximum of 2 to 3 years after rehabilitation until the area can be declared self-sustaining.	Medium	39 Low to medium

5. CONCLUSION

The dominant land use activities within the investigated study area include animal and crop farming. Sandstone outcrops were observed where the bedrock is exposed on the ground surface around the crest (hilltop) landscape position. This is indicative of severe erosion likely attributed to historic land uses, particularly overgrazing. Abandoned buildings and other non-soil features including residual concrete structures from historic infrastructure were also identified within the MRA area, and such areas and other existing buildings (mostly residential properties) were classified as Witbank (anthrosols).

The rocky outcrop areas comprise of indurated bedrock exposed on the ground surface with no overlying topsoil, comprising of approximately 31.2 ha, amounting to 14.1% of the MRA area. Whereas, the Witbank (anthrosols) soil group occupy approximately 3.7 ha, amounting to approximately 1.7% of the MRA area. The dominant soil types included Hutton (Hu), Clovelly (Cv), Mispah/Glenrosa/Dresden (Ms/Gs/Dr), Pinedene (Pn) and Fernwood (Fw) soil forms identified within the investigated MRA, as illustrated in Table 1 and Figure 9. The MRA area is dominated by Hutton and Clovelly soil forms, which collectively constitute approximately 92.5 ha, amounting to 41.8% of the MRA area. Whereas the shallow Mispah/Glenrosa/Dresden soil forms occupy approximately 15.1 ha, which amounts to 6.8% of the MRA area. The remainder of the study area is occupied by wetland soil types including Pinedene, Fernwood, and Avalon soil forms.

Table 11: Land Capability classes for soil forms identified within the MRA area.

Soil Form	Total Area (Ha)	% Areal Extent
Hutton/Clovelly	92.5	41.8
Rocky Outcrop	31.2	14.1
Westleigh/Avalon	20.5	9.3
Mispah/Glenrosa/Dresden	15.1	6.8
Witbank (Witbank (anthrosols))	3.7	1.7
Pinedene	1.4	0.6
Wetland	50.8	23
Residential Properties	6.0	2.7
Total Area	**221.2**	**100**

The findings of this assessment suggest that the relevant soil limiting factors within the MRA area for land capability and land use potential include the following:

- Seasonal waterlogging of the Pinedene and Fernwood soils associated with the hillslope seep wetland and prolonged waterlogging of the Katspruit soils associated with the pan wetland, due to poor internal drainage. These soils may contribute to local

subsistence farming, however, preservation of these soils under the protection of wetland resources according to the National Water Act, 1998 (Act No. 36 of 1998) takes precedence;

- Limited rooting depth due to periodic waterlogging of the Westleigh and Avalon soil forms within the inundated zone of the artificial impoundments within the hillslope seep wetland. Similar to Pinedene and Fernwood soils preservation of these soils for conservation purposes takes precedence, according to the National Water Act, 1998 (Act No. 36 of 1998);
- Shallow effective rooting depth due to shallow indurated bedrock of the Mispah/Glenrosa/Dresden soil forms. As such, these soils are not considered to contribute significantly to agricultural productivity;
- Lack of soil medium for plants and crop growth for the rocky outcrop, residential areas and Witbank (anthrosols).

From a land capability point of view, the proposed MRA area presents extensive areas of deep, well drained and well aerated soils with high agricultural potential soils, comprising just over 40% of the total MRA area. The rest of the MRA area is comprised of wetlands as well as soils not considered prime soils for agricultural production. The extent of Hutton/Clovelly soils thereof should be considered sufficient for viable cultivated small commercial farming, and thus should be avoided where feasible to minimise the loss of soil resources for current and future agricultural production. Of the 92.5 (41.8 %) ha of prime agricultural soils (Hutton/Clovelly) within the MRA area;

- 9.2 ha will be affected by the proposed surface infrastructure;
- 5.2 ha will be affected by the main mining block; and
- None will be affected by the north mining block.

Therefore, a total of 14.4 ha of prime agricultural soils is anticipated to be affected by the proposed mining project, however this can be reduced if mitigation measures, and recommendations outlined in this document are considered. The disturbance of prime agricultural soils is unavoidable however the resultant impact on these soil resources will be limited to the development footprint.

It is acknowledged that the grazing capacity as indicated by the Department of Agriculture, Land Reform and Rural Development (2021) [(Ref: MP 30/5/1/2/3/2/1 (10124)] is 3 ha/LSU based on the 1993 grazing capacity index, the veld has been transformed due to overgrazing and other historic anthropogenic activities. The veld is best described as a transformed rangeland. Other limitations include rocky outcrops (low productivity Mispah soils) which are

not suitable for any cultivated agricultural related activities. As such, the grazing capacity livestock commercial farming is not considered ideal for this area and a grazing capacity of 3 ha/LSU is unlikely to be achieved across the majority of the proposed extent of the mining footprint.

It is the opinion of the specialist, based on the information presented above, that this study provides the relevant information required to inform the Environmental Impact Assessment of the project to ensure that appropriate consideration of the agricultural resources in the study area will be made in support of the principles of Integrated Environmental Management (IEM) and sustainable development.

6. REFERENCES

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APPENDIX A – Risk Assessment Methodology

Impact Significance

Nature and Status

The 'nature' of the impact describes what is being affected and how. The 'status' is based on whether the impact is positive, negative or neutral.

Spatial Extent

'Spatial Extent' defines the spatial or geographical scale of the impact.

Category	Rate	Descriptor
Site	1	Site of the proposed development
Local	2	Limited to site and/or immediate surrounds
District	3	Victor Khanye Local Municipal Area
Region	4	NAvngala District Municipal Area
Provincial	5	Mpumalanga Province
National	6	South Africa
International	7	Beyond South African borders

Duration

'Duration' gives the temporal scale of the impact.

Category	Rate	Descriptor
Temporary	1	0 – 1 years
Short term	2	1 – 5 years
Medium term	3	5 – 15 years
Long term	4	Where the impact will cease after the operational life of the activity either because of natural process or by human intervention
Permanent	5	Where mitigation either by natural processes or by human intervention will not occur in such a way or in such a time span that the impact can be considered as transient

Probability

The 'probability' describes the likelihood of the impact actually occurring.

Category	Rate	Descriptor
Rare	1	Where the impact may occur in exceptional circumstances only
Improbable	2	Where the possibility of the impact materialising is very low either because of design or historic experience
Probable	3	Where there is a distinct possibility that the impact will occur
Highly probable	4	Where it is most likely that the impact will occur
Definite	5	Where the impact will occur regardless of any prevention measures

Intensity

'Intensity' defines whether the impact is destructive or benign, in other words the level of impact on the environment.

Category	Rate	Descriptor
Insignificant	1	Where the impact affects the environment is such a way that natural, cultural and social functions and processes are not affected. Localised impact and a small percentage of the population is affected
Low	2	Where the impact affects the environment is such a way that natural, cultural and social functions and processes are affected to a limited extent
Medium	3	Where the affected environment is altered in terms of natural, cultural and social functions and processes continue albeit in a modified way
High	4	Where natural, cultural or social functions or processes are altered to the extent that they will temporarily or permanently cease
Very High	5	Where natural, cultural or social functions or processes are altered to the extent that they will permanently cease and it is not possible to mitigate or remedy the impact

Ranking, Weighting and Scaling

The weight of significance defines the level or limit at which point an impact changes from low to medium significance, or medium to high significance. The purpose of assigning such weights serves to highlight those aspects that are considered the most critical to the various stakeholders and ensure that the element of bias is taken into account. These weights are often determined by current societal values or alternatively by scientific evidence (norms, etc.) that define what would be acceptable or unacceptable to society and may be expressed in the form of legislated standards, guidelines or objectives.

The weighting factor provides a means whereby the impact assessor can successfully deal with the complexities that exist between the different impacts and associated aspect criteria.

Spatial Extent	Duration	Intensity / Severity	Probability	Weighting factor	Significance Rating (SR - WOM) Pre-mitigation	Mitigation Efficiency (ME)	Significance Rating (SRWM) Post Mitigation
Site (1)	Short term (1)	Insignificant (1)	Rare (1)	Low (1)	Low (0 – 19)	High (0.2)	Low (0 – 19)
Local (2)	Short t o Medium term (2)	Minor (2)	Unlikely (2)	Low to Medium (2)	Low to Medium (20 – 39)	Medium to High (0.4)	Low to Medium (20 – 39)
District (3)							
Regional (4)	Medium term (3)	Medium (3)	Possible (3)	Medium (3)	Medium (40 – 59)	Medium (0.6)	Medium (40 – 59)
Provincial (5)	Long term (4)	High (4)	Likely (4)	Medium to High (4)	Medium to High (60 – 79)	Low to Medium (0.8)	Medium to High (60 – 79)
National (6)							
International (7)	Permanent (5)	Very high (5)	Almost certain (5)	High (5)	High (80 – 110)	Low (1.0)	High (80 – 110)

Impact significance without mitigation (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).

Equation 1:

Significance Rating (WOM) = (Extent + Intensity + Duration + Probability) x Weighting Factor

Effect of Significance on Decision-makings

Significance is determined through a synthesis of impact characteristics as described in the above paragraphs. It provides an indication of the importance of the impact in terms of both tangible and intangible characteristics. The significance of the impact "without mitigation" is the prime determinant of the nature and degree of mitigation required.

Rating	Rate	Descriptor
Negligible	0	The impact is non-existent or insignificant, is of no or little importance to decision making.
Low	1-19	The impact is limited in extent, even if the intensity is major; the probability of occurrence is low and the impact will not have a significant influence on decision-making and is unlikely to require management intervention bearing significant costs.
Low to Medium	20 – 39	The impact is of importance, however, through the implementation of the correct mitigation measures such potential impacts can be reduced to acceptable levels. The impact and proposed mitigation measures can be considered in the decision-making process
Medium	40 – 59	The impact is significant to one or more affected stakeholder, and its intensity will be medium or high; but can be avoided or mitigated and therefore reduced to acceptable levels. The impact and mitigation proposed should have an influence on the decision.
Medium to High	60 -79	The impact is of major importance but through the implementation of the correct mitigation measures, the negative impacts will be reduced to acceptable levels.
High	80 – 110	The impact could render development options controversial or the entire project unacceptable if it cannot be reduced to acceptable levels; and/or the cost of management intervention will be a significant factor and must influence decision making.

Mitigation

"Mitigation" is a broad term that covers all components of the 'mitigation hierarchy' defined hereunder. It involves selecting and implementing measures, amongst others, to conserve biodiversity and to protect, the users of biodiversity and other affected stakeholders from potentially adverse impacts because of mining or any other land use. The aim is to prevent adverse impacts from occurring or, where this is unavoidable, to limit their significance to an acceptable level. Offsetting of impacts is considered the last option in the mitigation hierarchy for any project.

The mitigation hierarchy in general consists of the following in order of which impacts should be mitigated:

- Avoid/prevent impact: can be done through utilising alternative sites, technology and scale of projects to prevent impacts. In some cases, if impacts are expected to be too high, the "no project" option should also be considered, especially where it is expected that the lower levels of mitigation will not be adequate to limit environmental damage and eco-service provision to suitable levels.
- Minimise (reduce) impact: can be done through utilisation of alternatives that will ensure that impacts on biodiversity and eco-services provision are reduced. Impact minimisation is considered an essential part of any development project.
- Rehabilitate (restore) impact is applicable to areas where impact avoidance and minimisation are unavoidable where an attempt to re-instate impacted areas and return them to conditions which are ecologically similar to the pre-project condition or an agreed post project land use, for example arable land. Rehabilitation can however not be considered as the primary mitigation toll as even with significant resources and effort rehabilitation that usually does not lead to adequate replication of the diversity and complexity of the natural system. Rehabilitation often only restores ecological function to some degree to avoid ongoing negative impacts and to minimise aesthetic damage to the setting of a project. Practical rehabilitation should consist of the following phases in best practice:
    - Structural rehabilitation which includes physical rehabilitation of areas by means of earthworks, potential stabilisation of areas as well as any other activities required to develop a long terms sustainable ecological structure;
    - Functional rehabilitation, which focuses on ensuring that the ecological functionality of the ecological resources on the subject property supports the intended post-closure land use. In this regard, special mention is made of the need to ensure the continued

functioning and integrity of wetland and riverine areas throughout and after the rehabilitation phase;

- Biodiversity reinstatement that focuses on ensuring that a reasonable level of biodiversity is re-instated to a level that supports the local post-closure land uses. In this regard, special mention is made of re-instating vegetation to levels which will allow the natural climax vegetation community of community suitable for supporting the intended post closure land use; and
- Species reinstatement that focuses on the re-introduction of any ecologically important species, which may be important for socio-cultural reasons, ecosystem functioning reasons and for conservation reasons. Species re-instatement need only occur if deemed necessary.

➢ Offset impact: refers to compensating for latent or unavoidable negative impacts on biodiversity. Offsetting should take place to address any impacts deemed unacceptable which cannot be mitigated through the other mechanisms in the mitigation hierarchy. The objective of biodiversity offsets should be to ensure no net loss of biodiversity. Biodiversity offsets can be considered a last resort to compensate for residual negative impacts on biodiversity.

According to the DMR (2013) "Closure" refers to the process for ensuring that mining operations are closed in an environmentally responsible manner, usually with the dual objectives of ensuring sustainable post-mining land uses and remedying negative impacts on biodiversity and ecosystem services.

The significance of residual impacts should be identified on a regional as well as national scale when considering biodiversity conservation initiatives. If the residual impacts lead to irreversible loss or irreplaceable biodiversity, the residual impacts should be considered to be of very high significance and when residual impacts are considered to be of very high significance, offset initiatives are not considered an appropriate way to deal with the magnitude and/or significance of the biodiversity loss. In the case of residual impacts determined to have medium to high significance, an offset initiative may be investigated. If the residual biodiversity impacts are considered of low significance, no biodiversity offset is required.

Impact significance 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 is necessary to re-evaluate the impact.

Mitigation Efficiency (ME)

The most effective means of deriving a quantitative value of mitigated impacts is to assign each significance rating value (WOM) a mitigation effectiveness (ME) rating. The allocation of such a rating is a measure of the efficiency and effectiveness, as identified through professional experience and empirical evidence of how effectively the proposed mitigation measures will manage the impact. Thus, the lower the assigned value the greater the effectiveness of the proposed mitigation measures and subsequently, the lower the impacts with mitigation.

Equation 2: Significance Rating (WM) = Significance Rating (WOM) x Mitigation Efficiency (ME)

Mitigation Efficiency is rated out of 1 as follows:

Category	Rate	Descriptor
Not Efficient (Low)	1	Mitigation cannot make a difference to the impact
Low to Medium	0.8	Mitigation will minimize impact slightly
Medium	0.6	Mitigation will minimize impact to such an extent that it becomes within acceptable standards
Medium to High	0.4	Mitigation will minimize impact to such an extent that it is below acceptable standards
High	0.2	Mitigation will minimize impact to such an extent that it becomes insignificant

Significance Following Mitigation (SFM)

The significance of the impact after the mitigation measures are taken into consideration. The efficiency of the mitigation measure determines the significance of the impact. The level of impact is therefore seen in its entirety with all considerations taken into account.

APPENDIX B – I&AP Comments and Responses

No	Comments/Suggestion/Question/Concern	Stakeholder, date & method	Response
	The following information must be included in the EIA: Current land use of the farm. Land capability and grazing capacity of the farm. I will comment further on the EIA report.	Rhulani Chavalala DAFF Online 23 Feb 2018	Noted. The current land use has been addressed in Section 3.2 (Historic and Current Land Use), while the grazing capacity has been addressed in the Section 3.1 and the Executive Summary. The land capability has been addressed in Section 3.2.2
	Department of Agriculture, Forestry and Fisheries does not have comments at this stages, comments will be forwarded on the Environmental Management Plan(EMP). DAFF would like you to provide the following information on the EMP: Current land use of the area Grazing capacity of the area Land Capability of the area and Detail soil study of the area	Rhulani Chavalala DAFF Email 23 Mar 2018	Noted. The current land use has been addressed in Section 3.2 (Historic and Current Land Use), while the grazing capacity has been addressed in the Section 3.1 and the Executive Summary. The detailed dominant soil forms and land capability information is presented in Section 3.2.2
	Detailed soil studies must be included in the EMPR. Weeds and invader plants management plan must be included in the EMPR. Current land use must be included in the EMPR. Sensitive areas like wetlands must not be disturbed.	Mary Mogale Department of Agriculture, Land Reform and Rural Development Email 19 Feb 2021	Noted. The weeds and invader plants management plan has been included in the Floral Assessment Report: Section compiled by SAS (April 2018 updated May 2021)

APPENDIX C – Specialists Details

DETAILS, EXPERTISE AND CURRICULUM VITAE OF SPECIALISTS

1.(a)(i) Details of the specialist who prepared the report

Sinethemba Mchunu	MSc Soil Science (University of Stellenbosch)
Braveman Mzila	BSc (Hons) Environmental Hydrology (University of KwaZulu Natal)
Stephen van Staden	MSc (Environmental Management) (University of Johannesburg)

1. (a). (ii) The expertise of that specialist to compile a specialist report including a curriculum vitae

Company of Specialist:	Scientific Aquatic Services		
Name / Contact person:	Stephen van Staden		
Postal address:	29 Arterial Road West Oriel Bedfordview		
Postal code:	1401	Cell:	083 415 2356
Telephone:	011 616 7893	Fax:	011 615 6240/ 086 724 3132
E-mail:	stephen@sasenvgroup.co.za		
Qualifications	MSc (Environmental Management) (University of Johannesburg) BSc (Hons) Zoology (Aquatic Ecology) (University of Johannesburg) BSc (Zoology, Geography and Environmental Management) (University of Johannesburg)		
Registration / Associations	Registered Professional Scientist at South African Council for Natural Scientific Professions (SACNASP) Accredited River Health practitioner by the South African River Health Program (RHP) Member of the South African Soil Surveyors Association (SASSO) Member of the Gauteng Wetland Forum		

SCIENTIFIC AQUATIC SERVICES (SAS) – SPECIALIST CONSULTANT INFORMATION
CURRICULUM VITAE OF STEPHEN VAN STADEN

PERSONAL DETAILS

Position in Company	Managing member, Ecologist, Aquatic Ecologist
Date of Birth	13 July 1979
Nationality	South African
Languages	English, AfriAvans
Joined SAS	2003 (year of establishment)

MEMBERSHIP IN PROFESSIONAL SOCIETIES

Registered Professional Scientist at South African Council for Natural Scientific Professions (SACNASP)
Accredited River Health practitioner by the South African River Health Program (RHP)
Member of the South African Soil Surveyors Association (SASSO)
Member of the Gauteng Wetland Forum

EDUCATION

Qualifications

MSc (Environmental Management) (University of Johannesburg)	2002
BSc (Hons) Zoology (Aquatic Ecology) (University of Johannesburg)	2000
BSc (Zoology, Geography and Environmental Management) (University of Johannesburg)	1999

COUNTRIES OF WORK EXPERIENCE

South Africa – All Provinces
Southern Africa – Lesotho, Botswana, Mozambique, Zimbabwe
Eastern Africa – Tanzania
West Africa – Ghana, Liberia, Angola, Guinea Bissau
Central Africa – Democratic Republic of the Congo

SELECTED PROJECT EXAMPLES

Development compliance studies

- Project co-leader for the development of the EMP for the use of the Wanderers stadium for the Ubuntu village for the World Summit on Sustainable Development (WSSD).
- Environmental Control Officer for Eskom for the construction of an 86Km 400KV power line in the Rustenburg Region.
- Numerous Environmental Impact Assessment (EIA) and EIA exemption applications for township developments and as part of the Development Facilitation Act requirements.
- EIA for the extension of mining rights for a Platinum mine in the Rustenburg area by Lonmin Platinum.
- EIA Exemption application for a proposed biodiesel refinery in Chamdor.
- Compilation of an EIA as part of the BanAvble Feasibility Study process for proposed mining of a gold deposit in the Lofa province, Liberia.
- EIA for the development of a Chrome Recovery Plant at the Two Rivers Platinum Mine in the Limpopo province, South Africa.
- Compilation of an EIA as part of the BanAvble Feasibility Study process for the Mooihoek Chrome Mine in the Limpopo province, South Africa.
- Mine Closure Plan for the Vlakfontein Nickel Mine in the North West Province.

Specialist studies and project management

- Development of a zero discharge strategy and associated risk, gap and cost benefit analyses for the Lonmin Platinum group.
- Development of a computerised water balance monitoring and management tool for the management of Lonmin Platinum process and purchased water.
- The compilation of the annual water monitoring and management program for the Lonmin Platinum group of mines.
- Analyses of ground water for potable use on a small diamond mine in the North West Province.
- Project management and overview of various soil and land capability studies for residential, industrial and mining developments.
- The design of a stream diversion of a tributary of the Olifants River for a proposed opencast coal mine.
- Waste rock dump design for a gold mine in the North West province.
- Numerous wetland delineation and function studies in the North West, Gauteng and Mpumalanga Kwa-Zulu Natal provinces, South Africa.
- Hartebeespoort Dam Littoral and Shoreline PES and rehabilitation plan.
- Development of rehabilitation principles and guidelines for the Crocodile West Marico Catchment, DWAF North West.

Aquatic and water quality monitoring and compliance reporting

- Development of the Resource Quality Objectives for the Local Authorities in the Upper Crocodile West Marico Water management Area.
- Development of the 2010 State of the Rivers Report for the City of Johannesburg.
- Development of an annual report detailing the results of the Lonmin Platinum groups water monitoring program.
- Development of an annual report detailing the results of the Everest Platinum Mine water monitoring program.
- Initiation and management of a physical, chemical and biological monitoring program, President Steyn Gold Mine Welkom.
- Aquatic biomonitoring programs for several Xstrata Alloys Mines and Smelters.
- Aquatic biomonitoring programs for several Anglo Platinum Mines.
- Aquatic biomonitoring programs for African Rainbow Minerals Mines.
- Aquatic biomonitoring programs for several Assmang Chrome Operations.
- Aquatic biomonitoring programs for Petra Diamonds.
- Aquatic biomonitoring programs for several coal mining operations.
- Aquatic biomonitoring programs for several Gold mining operations.
- Aquatic biomonitoring programs for several mining operations for various minerals including iron ore, and small platinum and chrome mining operations.
- Aquatic biomonitoring program for the Valpre bottled water plant (Coca Cola South Africa).
- Aquatic biomonitoring program for industrial clients in the paper production and energy generation industries.
- Aquatic biomonitoring programs for the City of Tshwane for all their Waste Water Treatment Works.
- Baseline aquatic ecological assessments for numerous mining developments.
- Baseline aquatic ecological assessments for numerous residential commercial and industrial developments.
- Baseline aquatic ecological assessments in southern, central and west Africa.
- Lalini Dam assessment with focus on aquatic fish community analysis.
- Musami Dam assessment with focus on the FRAI and MIRAI aquatic community assessment indices.

Wetland delineation and wetland function assessment

- Wetland biodiversity studies for three copper mines on the copper belt in the Democratic Republic of the Congo.
- Wetland biodiversity studies for proposed mining projects in Guinea Bissau, Liberia and Angola in West Africa.
- Terrestrial and wetland biodiversity studies for developments in the mining industry.
- Terrestrial and wetland biodiversity studies for developments in the residential commercial and industrial sectors.
- Development of wetland riparian resource protection measures for the Hartbeespoort Dam as part of the Harties Metsi A Me integrated biological remediation program.
- Priority wetland mammal species studies for numerous residential, commercial, industrial and mining developments throughout South Africa.

Terrestrial ecological studies and biodiversity studies

- Biodiversity Action plans for numerous mining operations of Assmang Chrome throughout South Africa in line with the NEMBA requirements.
- Biodiversity Action plans for numerous mining operations of Xstrata Alloys and Mining throughout South Africa in line with the NEMBA requirements.
- Biodiversity Action plan for the Nkomati Nickel and Chrome Mine Joint Venture.
- Terrestrial and wetland biodiversity studies for three copper mines on the copperbelt in the Democratic Republic of the Congo.
- Terrestrial and wetland biodiversity studies for proposed mining projects in Guinea Bissau, Liberia and Angola in West Africa.
- Numerous terrestrial ecological assessments for proposed platinum and coal mining projects.
- Numerous terrestrial ecological assessments for proposed residential and commercial property developments throughout most of South Africa.
- Specialist Giant bullfrog (*Pyxicephalus adspersus*) studies for several proposed residential and commercial development projects in Gauteng, South Africa.
- Specialist Marsh sylph (*Metisella meninx*) studies for several proposed residential and commercial development projects in Gauteng, South Africa.
- Project management of several Red Data Listed (RDL) bird studies with special mention of African grass owl (*Tyto capensis*).
- Project management of several studies for RDL Scorpions, spiders and beetles for proposed residential and commercial development projects in Gauteng, South Africa.
- Specialist assessments of terrestrial ecosystems for the potential occurrence of RDL spiders and owls.
- Project management and site specific assessment on numerous terrestrial ecological surveys including numerous studies in the Johannesburg-Pretoria area, Witbank area, and the Vredefort dome complex.
- Biodiversity assessments of estuarine areas in the Kwa-Zulu Natal and Eastern Cape provinces.
- Impact assessment of a spill event on a commercial maize farm including soil impact assessments.

Fisheries management studies

- Tamryn Manor (Pty.) Ltd. still water fishery initiation, enhancement and management.
- Verlorenkloof Estate fishery management strategising, fishery enhancement, financial planning and stocking strategy.
- Mooifontein fishery management strategising, fishery enhancement and stocking programs.
- WicAvms retreat management strategising.
- Gregg Brackenridge management strategising and stream recalibration design and stocking strategy.
- Eljira Farm baseline fishery study compared against DWAF 1996 aquaculture and aquatic ecosystem guidelines.

SCIENTIFIC AQUATIC SERVICES (SAS) – SPECIALIST CONSULTANT INFORMATION
CURRICULUM VITAE OF SINETHEMBA MCHUNU

PERSONAL DETAILS

Position in Company	Soil Scientist
Date of Birth	24 April 1988
Nationality	South African
Languages	English, isiZulu
Joined SAS	2015

MEMBERSHIP IN PROFESSIONAL SOCIETIES

Professional member of the South African Council for Natural Scientific Professions (SACNASP)
Member of the South African Soil Surveyors Organisation (SASSO)
Member of the Land Rehabilitation Society of Southern Africa (LaRSSA)
Member of the Soil Science Society of South Africa (SSSSA)

EDUCATION

Qualifications

M.Sc Soil Science – University of Stellenbosch (2012) 2009
B.Sc (Hons) Soil Science – University of Stellenbosch (2010)
B.Sc. Agric. Soil Science and Viticulture – University of Stellenbosch (2009)

COUNTRIES OF WORK EXPERIENCE

South Africa – Gauteng, Mpumalanga, North West, Limpopo, Free State, KwaZulu-Natal, Northern Cape, and Western Cape

RELEVANT WORKING EXPERIENCE

Sept 2012 – Nov 2013: Soil Scientist at Strategic Environmental Focus (Pty) Ltd; specialising in Soil Contamination, Land Capability and Agricultural Potential assessments, Groundwater Monitoring, and providing specialist input for various EIA, BA, and Risk and Liability Assessment reports.

Dec 2013 – Apr 2015 Contaminated Site Consultant at Environmental Resources Management (ERM) South Africa; managing hydrocarbon contamination projects for contaminated soil and groundwater investigations, and soil waste classification for landfill disposal.

May 2015 – May 2017 Soil Scientist at Scientific Aquatic Services (SAS) cc; specialising in Soil Contamination, Land Capability and Agricultural Potential assessments.

SELECTED PROJECT EXAMPLES

Impact Assessment Investigations

- Soil and Land Capability Impact Assessment for the proposed Xstrata Coal Mine in Paardekop, Mpumalanga Province, South Africa;
- Soil and Land Capability Impact Assessment for the proposed Xstrata Coal Mine in Amersfoort, Mpumalanga Province, South Africa;
- Agricultural Impact Assessment for a proposed 30 megaWatts (MW) Photo Voltaic (PV) Solar Facility in Mareetsane, North West Province, South Africa;
- Soil and Land Capability Impact Assessment for the proposed BioGas Plant facility in Malmesbury, Western Cape Province, South Africa; and
- Soil and Agricultural Potential Assessment for the proposed Hulett Milling Plant at the Owen Sithole College of Agriculture (OSCA) in Empangeni, KwaZulu Natal Province, South Africa.

Contaminated Site Investigations

- Soil and Groundwater contamination assessments prior to installation and decommissioning of underground fuel storage tanks at multiple petroleum filling stations within the Gauteng, Limpopo, Free State, Northern Cape, and North West Provinces;
- Soil contamination assessment at ELCA Engineering Turbo Manufacturing and Fabrication to inform the due diligence process;
- Bi-annual soil contamination assessment at BHP Billiton Klipspruit Coal Mine for Water Use Licence compliance;
- Soil and Groundwater contamination assessments at multiple Mining and Distribution operations with private fuel storage facilities; and
- Sediment and water quality assessment for the Bokoni Platinum Mine.

SCIENTIFIC AQUATIC SERVICES (SAS) – SPECIALIST CONSULTANT INFORMATION
CURRICULUM VITAE OF BRAVEMAN MZILA

PERSONAL DETAILS

Position in Company	Wetland Ecologist and Soil Scientist
Date of Birth	03 January 1991
Nationality	South African
Languages	IsiZulu, English
Joined SAS	2017

EDUCATION

Qualifications

BSc (Hons) Environmental Hydrology (University of KwaZulu-Natal)	2013
BSc Hydrology and Soil Science (University of KwaZulu-Natal))	2012

COUNTRIES OF WORK EXPERIENCE

South Africa – Gauteng, Mpumalanga, KwaZulu-Natal, Eastern Cape

SELECTED PROJECT EXAMPLES

Freshwater Ecological Assessments

- Freshwater ecological assessment as part of the water use authorisation relating to stormwater damage of a tributary of the Sandspruit, Norwood, Gauteng province.
- Wetland verification as part of the environmental assessment and authorization process for the proposed development in Crowthorne extension 67, Gauteng province.
- Freshwater assessment as part of the section 24g rectification process for unauthorised construction related activities that took place on erf 411, Ruimsig extension 9, Gauteng province
- Baseline aquatic and freshwater assessment as part of the environmental assessment and authorisation process for the N11 Ring Road, Mokopane, Limpopo Province
- Wetland Resource Scoping Assessment as Part of the Environmental Assessment and Authorisation Process for the Kitwe TSF Reclamation Project, Kitwe, Zambia
- Wetland delineation as part of the environmental assessment and authorization process for the proposed development in Boden Road, Benoni, Ekurhuleni Metropolitan Municipality, Gauteng Province.

Soil, Land Use and Land Capability Assessments

- Soil, Land Use and Land Capability Assessment as part of the environmental assessment and authorisation process for the proposed Witfontein Railway Siding Project Near Bethal, Mpumalanga Province
- Soil, Land Use and Land Capability Assessment as part of the environmental assessment and authorisation process for the proposed Heuningkranz Mine, Postmasburg, Northern Cape Province
- Soil, Land Use and Land Capability Assessment as Part of The Environmental Assessment And Authorisation Process For The Proposed Avnakies Mining Project, Near Loeriesfontein, Northern Cape

Hydropedological Wetland Impact Assessments

- Hydropedological Assessment as Part of the Environmental Assessment and Authorisation Process for the proposed Vandyksdrift Central Dewatering Project
- Hydropedological Assessment for the Proposed Evander Gold Elikhulu Tailings Storage Facility (TSF) Expansion, Mpumalanga Province
- Hydropedological Assessment as part of the environmental assessment and authorisation process for the proposed Palmietkuilen Mine, Springs, Gauteng Province
- Hydropedological Assessment as part of the environmental assessment and authorisation process for the proposed Uitkomst Colliery Mine expansion, Newcastle, KwaZulu-Natal Province

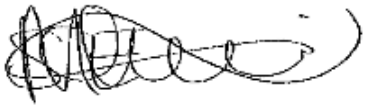
Soil Rehabilitation Assessments

- Soil rehabilitation plan, a water resource assessment and develop a management plan in support of the water use license for the Driefontein operations, Carletonville, Gauteng

1.(b) A declaration that the specialist is independent in a form as may be specified by the competent authority

I, Sinethemba Mchunu, declare that -

- I act as the independent specialist in this application;
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the relevant legislation and any guidelines that have relevance to the proposed activity;
- I will comply with the applicable legislation;
- 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 form are true and correct



Signature of the Specialist

I, Stephen van Staden, declare that -

- I act as the independent specialist in this application;
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the relevant legislation and any guidelines that have relevance to the proposed activity;
- I will comply with the applicable legislation;
- 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 form are true and correct

Signature of the Project Manager