

# **APPENDIX 6**

## **SPECIALISTS STUDIES**

# HERITAGE STUDY

**Phase 1 Heritage Impact Assessment for extension  
of existing Borrow Pit near Stella, Northwest  
Province.**

Report prepared by  
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December 2022



## Summary

A Phase 1 Heritage Impact Assessment was carried out for the extension of an existing Borrow Pit near Stella, Northwest Province. The 4.5 ha surface area is capped by semi- to unconsolidated Kalahari Group soils, made up of a thick mantle of surface calcretes within a red-brown aeolian sand matrix, where no fossils or fossil exposures were observed. A foot survey of the study area show no aboveground evidence of historically significant structures, Iron Age sites, graves or *in situ* Stone Age archaeological material, capped or distributed as surface scatters on the landscape. The site has been severely degraded by prior quarrying activities and other forms of informal land use. The underlying basalts and Quaternary overburden are not considered to be palaeontologically sensitive. The study area is considered to be of low archaeological significance and is assigned a site rating of Generally Protected C.

## Introduction

A Phase 1 Heritage Impact Assessment was carried out for the extension of an existing Borrow Pit near Stella, Northwest Province (**Fig. 1**). The assessment is required as a prerequisite for new development in terms of the the National Heritage Resources Act (NHRA) No. 25 of 1999. The region's unique and non-renewable heritage sites are 'Generally' protected in terms of the NHRA and may not be damaged or disturbed without a permit from the relevant heritage resources authority (**Table 1**). The task (terms of reference) involved identification of possible archaeological and palaeontological sites or occurrences within the proposed development area(s), an assessment of their significance, possible impact by the proposed development and recommendations for mitigation where relevant.

## Methodology

Preliminary evaluation of the affected area(s) was based on field records, database information, published literature and geological maps. This was followed up with a field assessment and foot survey. A Garmin Etrex Vista GPS hand model (set to the WGS 84 map datum) and a digital camera were used for recording purposes. Site significance classification standards, as prescribed by SAHRA, were used for the purpose of this evaluation (Table 2).

## Locality data

1 : 50 000 scale topographic map: 2624 DB\_Stella.

1 : 250 000 geological map 2624 Vryburg.

The proposed development footprint covers 4.5 ha of low-lying terrain on Farm

Zoutpansfontein 546 IN, situated on the north-western outskirts of Stella (**Fig 2**). The site forms part of an old borrow pit and is also used informally for cattle grazing (**Fig. 3**).

Site coordinates (Fig. 2)

- A) 26°32'41.93"S 24°51'21.07"E
- B) 26°32'40.58"S 24°51'27.39"E
- C) 26°32'45.50"S 24°51'32.17"E
- D) 26°32'47.53"S 24°51'26.90"E
- E) 26°32'47.36"S 24°51'22.17"E

## **Background**

The geology of the study area is shown on the 1: 250 000 geology map 2624 Vryburg (Council for Geoscience, Pretoria) and has been described by Keyser & Du Plessis 1993). The site is underlain by Venterdorp Supergroup volcanic rocks (Allanridge Formation), which are capped by more recent Kalahari Group deposits (**Fig 3**). The Kathu-Kuruman-Taung region situated to the south and southwest of Stella is generally rich in Early, Middle and Later Stone Age open sites / surface scatters. Intact palaeontological and Stone Age archaeological sites are frequent and widespread in the region and include important localities like Taung, Kathu Pan, and Wonderwerk Cave (**Fig. 4**). The archaeological footprint around Dithakong, located between Vryburg and Stella, is primarily represented by stonewall remnants of the early 19<sup>th</sup> century BaTlaping capital Dithakong, located near the modern village of Dithakong (**Fig. 5**). At the time of the 1801-1803 Borchers and Somerville expedition, Dithakong was an important BaTlaping (BaTswana) capital. It was calculated that the number of huts there were at least not less than 1 500 and the number of occupants at somewhere between 8 000 and 25 000. Iron Age sites found around Stella include Gamohaam, Maropeng, Batlharos and Mahakane as well as Kinderdam, situated halfway between Vryburg and Madibogo (**Fig. 6**). The Stellaland area, which includes the town of Stella, was incorporated as a British protectorate into British Bechuanaland in 1884, which in turn became part of the Cape Colony in 1895 (**Fig. 7**).

## **Field Assessment, Impact Statement and Recommendations**

The site is capped by semi- to unconsolidated Kalahari Group soils made up of a thick mantle of surface calcretes and a red-brown aeolian sand matrix where no fossils or fossil exposures were observed. A foot survey of the study area show no aboveground evidence of historically significant structures, Iron Age sites, graves or *in situ* Stone Age archaeological material, capped or distributed as surface scatters on the landscape. The site has been severely degraded

by prior quarrying activities and other forms of informal land use. The underlying basalts and Quaternary overburden are not considered to be palaeontologically sensitive. The study area is considered to be of low archaeological significance and is assigned a site rating of Generally Protected C (**Table 2**).

## References

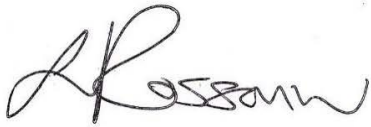
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engravings from Wonderwerk Cave, South Africa. *Science* 214, 64-67.

DECLARATION OF INDEPENDENCE

Paleo Field Services act as an independent specialist consultant and do not or will not have any financial interest in the undertaking of the activity other than remuneration for work as stipulated in the terms of reference. Paleo Field Services has no interest in secondary or downstream developments as a result of the authorization of this project.

Yours truly,

A handwritten signature in black ink, appearing to read 'A. Rossouw'. The signature is written in a cursive, flowing style.

01 / 12 / 2022

## Tables and Figures

**Table 1.** The NHRA (Act no. 25 of 1999) identifies what is defined as a heritage resource, the criteria for establishing its significance and lists specific activities for which a heritage specialist study may be required. In this regard, categories potentially relevant to the proposed development are listed in Section 34 (1), Section 35 (4), Section 36 (3) and Section 38 (1) of the NHRA and are as follows:

Section 34. (1) No person may alter or demolish any structure or part of a structure which is older than 60 years without a permit issued by the relevant provincial heritage resources authority.
Section 35 (4) No person may, without a permit issued by the responsible heritage resources authority —
<ul style="list-style-type: none"> <li>• destroy, damage, excavate, alter, deface or otherwise disturb any archaeological or palaeontological site or any meteorite;</li> <li>• <i>b)</i> destroy, damage, excavate, remove from its original position, collect or own any archaeological or palaeontological material or object or any meteorite;</li> </ul>
36 (3) No person may, without a permit issued by SAHRA or a provincial heritage resources authority—
<ul style="list-style-type: none"> <li>• (a) destroy, damage, alter, exhume or remove from its original position or otherwise disturb the grave of a victim of conflict, or any burial ground or part thereof which contains such graves;</li> <li>• (b) destroy, damage, alter, exhume, remove from its original position or otherwise disturb any grave or burial ground older than 60 years which is situated outside a formal cemetery administered by a local authority; or</li> <li>• (c) bring onto or use at a burial ground or grave referred to in paragraph (a) or (b) any excavation equipment, or any equipment which assists in the detection or recovery of metals.</li> </ul>
38 (1) Subject to the provisions of subsections (7), (8) and (9), any person who intends to undertake a development categorised as —
<ul style="list-style-type: none"> <li>• The construction of a road, wall, power line, pipeline, canal or other similar form of linear development or barrier exceeding 300 m in length;</li> <li>• The construction of a bridge or similar structure exceeding 50 m in length;</li> <li>• Any development or other activity which will change the character of the site</li> </ul>
a) exceeding 5000 m <sup>2</sup> in extent; or
b) involving three or more existing erven or subdivisions thereof; or
c) involving three or more subdivisions thereof which have been consolidated within the past five years;
<ul style="list-style-type: none"> <li>• The rezoning of a site exceeding 10 000 m<sup>2</sup>; or</li> <li>• Any other category of development provided for in regulations by the South African Heritage Resources Agency (SAHRA).</li> </ul>



**Table 2.** Field rating categories for heritage sites as prescribed by SAHRA.

<b>Field Rating</b>	<b>Grade</b>	<b>Significance</b>	<b>Mitigation</b>
National Significance (NS)	Grade 1	-	Conservation; national site nomination
Provincial Significance (PS)	Grade 2	-	Conservation; provincial site nomination
Local Significance (LS)	Grade 3A	High significance	Conservation; mitigation not advised
Local Significance (LS)	Grade 3B	High significance	Mitigation (part of site should be retained)
Generally Protected A (GP.A)	-	High/medium significance	Mitigation before destruction
Generally Protected B (GP.B)	-	Medium significance	Recording before destruction
Generally Protected C (GP.C)	-	Low significance	Destruction

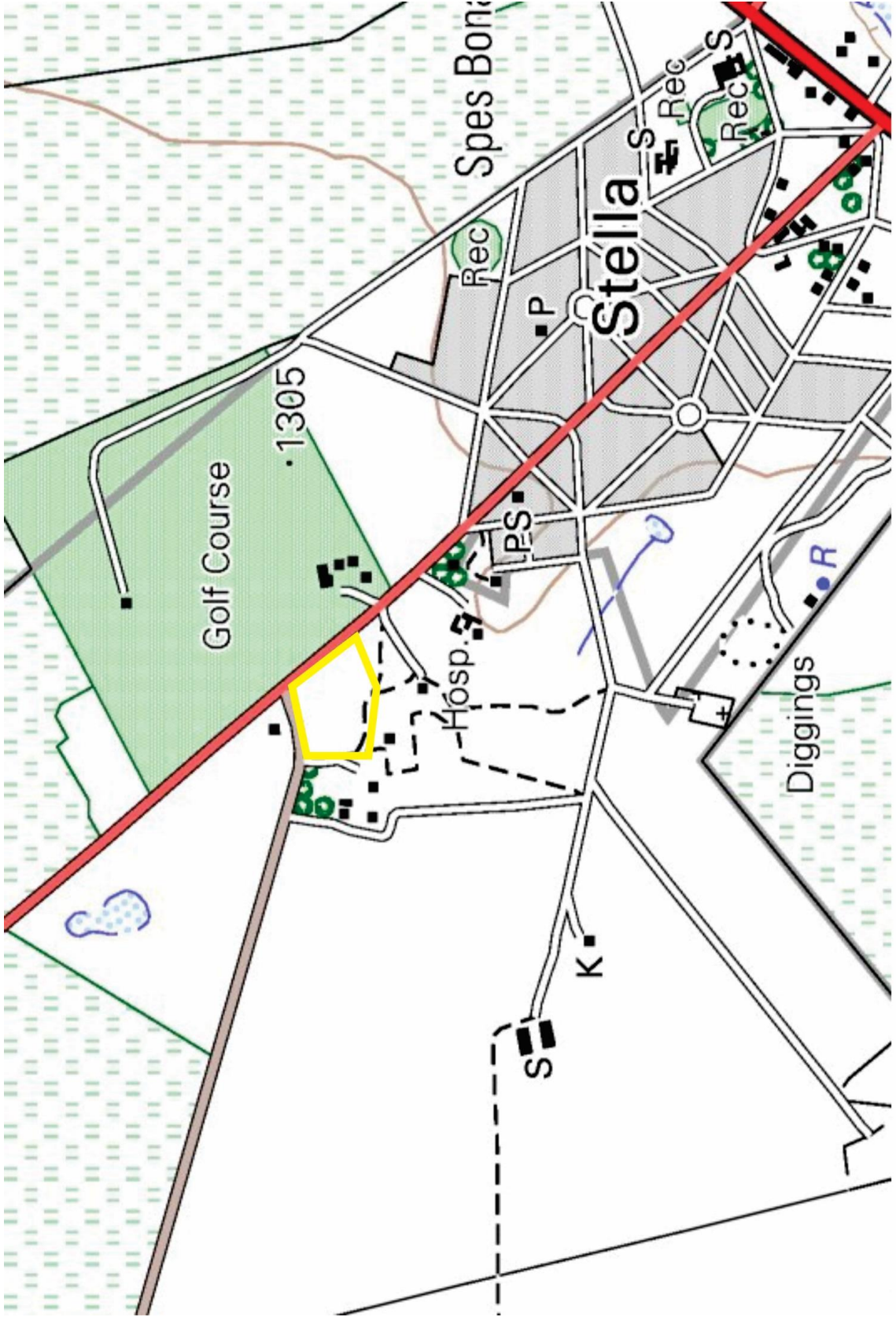


Figure 1. Map of the proposed development (portion of 1:50 000 scale topographic map 2624DB Stella).



Figure 2. Layout of the Borrow Pit footprint



Figure 3. General view of the site, looking east (above left), west (above right), south (below left) and north (below right)..





Figure 5. Extensive stone wall enclosures are found near Dithakong. Archaeological investigations conducted during the 1980's have revealed that the ruins were built during the 15th century A.D.

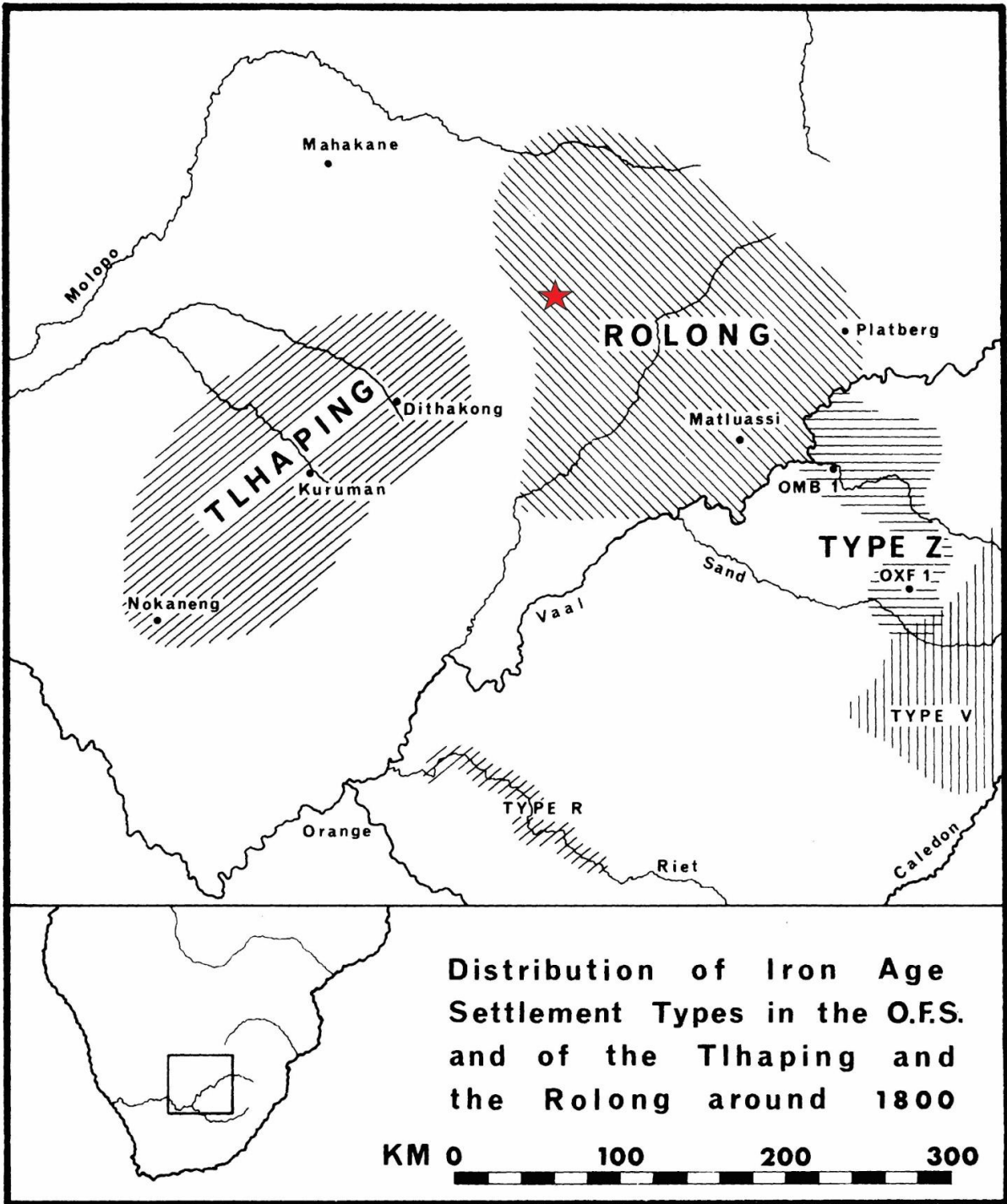


Figure 6. Distribution of the Tlhaping and Rolong in the region at the beginning of the 19th century according to Maggs (1972). Position of Stella indicated by red star.

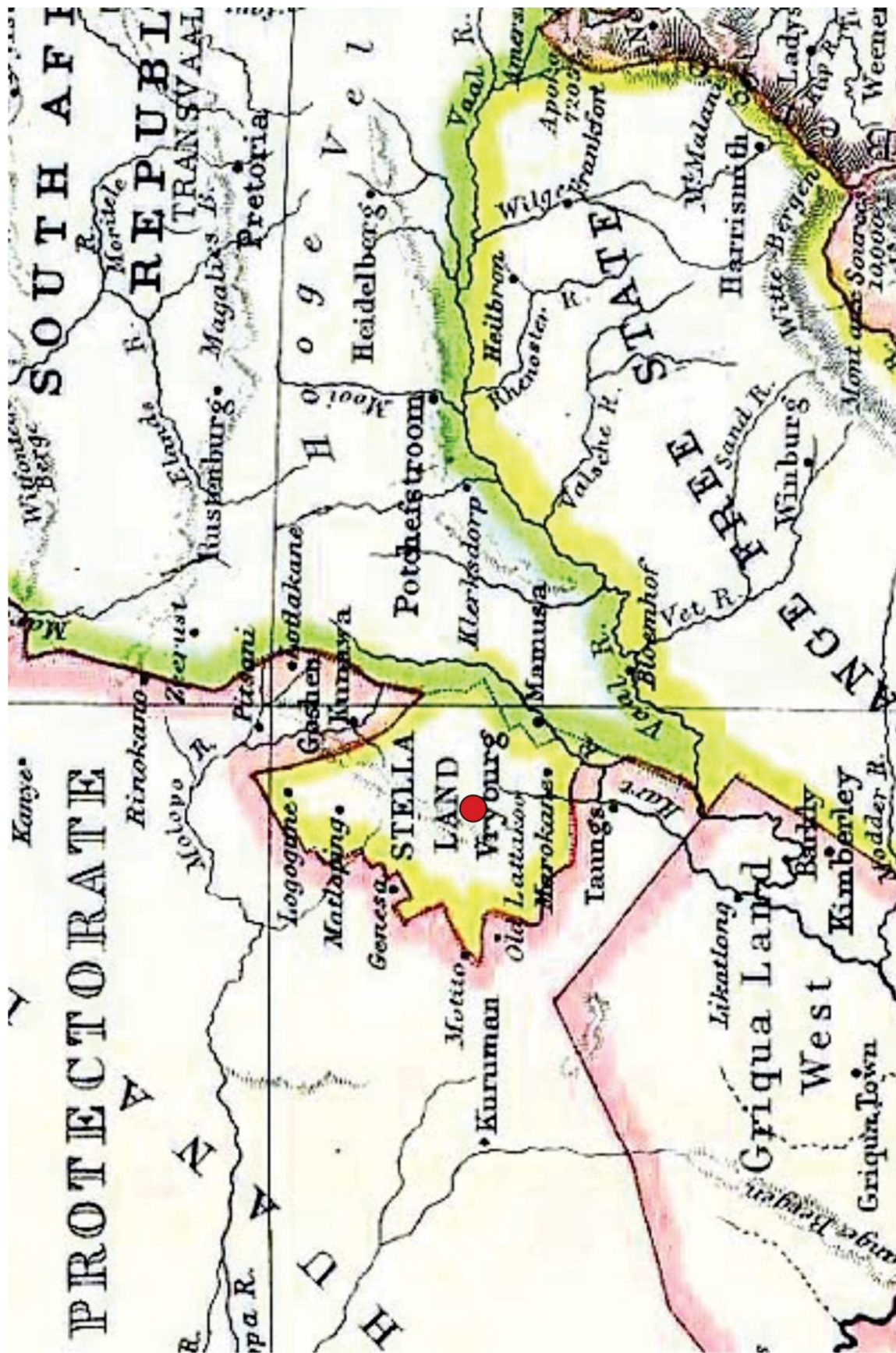


Figure 7. Contemporary map of Stellaland prior to its incorporation as a British protectorate in 1884.



## Appendix 1: Survey Track Log

Index	Coordinates
1	S26 32 40.1 E24 51 27.0
2	S26 32 40.9 E24 51 24.5
3	S26 32 41.3 E24 51 22.7
4	S26 32 41.4 E24 51 21.8
5	S26 32 42.8 E24 51 23.6
6	S26 32 42.6 E24 51 25.8
7	S26 32 44.2 E24 51 27.8
8	S26 32 43.8 E24 51 29.3
9	S26 32 44.9 E24 51 30.7
10	S26 32 45.8 E24 51 29.4
11	S26 32 41.6 E24 51 27.2
12	S26 32 42.1 E24 51 22.6
13	S26 32 44.4 E24 51 22.5
14	S26 32 45.3 E24 51 24.2
15	S26 32 45.7 E24 51 27.0



# ECOLOGICAL STUDY

*APPENDIX 6.2*



Environmental  
Management Group  
(PTY) LTD.

August 2022

# **SITE SENSITIVITY AND TERRESTRIAL ECOLOGY VERIFICATION REPORT**

Compiled for the Environmental  
authorisation for a mining permit  
registration of a Borrow Pit outside  
Stella, North West

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*BSc. Honours majoring in Botany (Vegetation Ecology and Plant Taxonomy) – University of the Free State (2019)*

*BSc. Majoring in Botany and Zoology – University of the Free State (2018)*

Declaration of independence:

I, the above-mentioned specialist investigator responsible for conducting this particular specialist ecological study, declare that

- I consider myself bound to the rules and ethics of the South African Council for Natural Scientific Professions (SACNASP);
- At the time of conducting the study and compiling this report I did not have any interest, hidden or otherwise, in the proposed development, except for financial compensation for work done in a professional capacity;
- Work performed for this study was done in an objective manner. Even if this study results in views and findings that are not favourable to the client/applicant, I will not be affected in any manner by the outcome of any environmental process of which this report may form a part;
- I declare that there are no circumstances that may compromise my objectivity in performing this specialist investigation. I do not necessarily object to or endorse the proposed development, but aim to present facts, findings and recommendations based on relevant professional experience, and scientific data;
- I do not have any influence over decisions made by the governing authorities;
- I have the necessary qualifications and guidance from professional experts (registered Pr. Nat. Sci.) in conducting specialist reports relevant to this application, including knowledge of the Act, regulations and any guidelines that have relevance to the proposed activity
- This document and all information contained herein are and will remain the intellectual property of Environmental Management Group. This document, in its entirety or any portion thereof, may not be altered in any manner or form, for any purpose without the specific and written consent of the respective specialist investigator.



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Emma Ferreira

**External report review:**

Ecological report prepared by: Environmental Management Group (PTY) Ltd.  
*EL Ferreira (MSc)*

Report prepared for: Naledi Local Municipality

Locality: Stella, North West, South Africa

<b>Reviewer</b>	<b>Qualification</b>	<b>Professional registration</b>	<b>Signature</b>

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## Executive summary:

An open, active, unregistered borrow pit within the town boundaries of Stella, North West issues an unsafe environment and hazard to the local community. The need for a responsible authority of the borrow pit and its registration and subsequent environmental authorisation is irrefutable. As part of the environmental authorisation for a mining permit, this document serves as a terrestrial biodiversity compliance statement for the proposed registered borrow pit area. These compliance statements align with NEMA procedures for the assessment and minimum criteria for reporting on identified environmental themes when applying for environmental authorisation (NEMA, 2020).

This report aims to verify and evaluate the present-day in situ environmental conditions of the receiving environment at the location of the proposed registered borrow pit area. Additionally, this report assesses the anticipated environmental impacts of the proposed registered borrow pit on the receiving environment and provides recommendations and mitigation measures.

The DFFE screening tool report indicated a very high sensitivity for aquatic biodiversity, medium sensitivity for plant species and low sensitivity for terrestrial biodiversity. However, the aquatic biodiversity site verification found the site to be of low sensitivity. Despite the medium sensitivity for plant species, no sensitive species were found during the site visit. The low sensitivity for terrestrial biodiversity site verification agreed with the low sensitivity provided by the screening tool report. Thus, reporting on terrestrial biodiversity in compliance statements is required.

Site sensitivity for the proposed registered borrow pit area was identified as low. The absence of SCC, the presence of only one individual of a nationally protected tree species (*Vachellia erioloba*), alien and invasive species, the site's current ecological state and ongoing ecological disturbances/impacts confirm the low sensitivity rating of the site.

The proposed registered borrow pit is a small area (<5 ha) that is relatively isolated from broader habitats. Ground truthing of the proposed registered borrow pit area agrees with the floral or vegetative elements and overall vegetation structure of the Stella Bushveld vegetation type described by Mucina and Rutherford (2006). However, the vegetation within the study area is a degraded or heavily disturbed form of the Stella Bushveld vegetation type. Additionally, the study area was found to be in a severely modified state. Roughly 45% of the site has been influenced by excavation activities, which is largely responsible for the site's ecological state.

Overall anticipated environmental impacts will be very low with or without mitigation measures. Although implementing mitigation measures will not drastically influence the anticipated environmental impacts, it will ensure the best possible recovery of the site's receiving environment.

## **1. Introduction:**

### **1.1. Project background:**

Development is necessary, especially for a developing country such as South Africa. New developments create job opportunities, increase capital growth, and overall create a better country (Wohlitz, 2016). In order to keep up with the growing population and subsequent job creation, the Naledi Local Municipality needs to undergo infrastructure development. Necessary service deliveries within the surrounding areas have been influenced by vandalism inflicted on infrastructure, supporting the further need for the re-development of vandalised infrastructure.

Thus, it is crucial to use suitable construction material for infrastructure development and re-development. This material will be vital to the growth of the Naledi Local Municipality and will provide the opportunity for job creation and upgrading of existing infrastructure.

Located less than 2km Northwest of Stella, North West, the unregistered borrow pit is situated to the west of the R377 on the remaining portion 18 of Farm Biesjes Bult 549. Access to the borrow pit area is possible from two gravel/sand roads that exit the R377 to the left. However, the maintenance of the southernmost access road that is somewhat informal, narrow and slightly winding is derelict, limiting the road usage by large vehicles. Large vehicles and heavy machinery subsequently use the northernmost access road to access the mining area. Surface mining is currently active within the borrow pit area. As the site is located within 2km of the town, it is not isolated from infrastructure development and town expansion. However, as it is not isolated from infrastructure development and town expansion, it poses a safety risk to the community.

As an unregistered, unrecorded, open, and illegally active borrow pit, the need for registration of the borrow pit is a priority. The aim is thus to assign a responsible person/authority to the borrow pit and its management. Upon registration, a responsible person/authority will be assigned to standardise and regulate legal mining activities within the borrow pit.

For the reasons mentioned above, it is necessary to conduct an ecological assessment to assess the possible environmental impacts generated by mining or excavating activities. Recommendations and mitigation measures provided in this report should be used to minimise the effects of mining.

### **1.2. Terms of reference:**

In accordance with the National Environmental Management Act (Act 107 of 1998, as amended) (NEMA) Environmental Impact Assessment (EIA) Regulations of 2017, a site sensitivity verification has been undertaken to confirm the current land use and



environmental sensitivity of the proposed project area as identified by the National Web-Based Environmental Screening Tool (Screening Tool).

### **1.3. DFFE screening tool identified theme sensitivities:**

As per the DFFE screening tool, the proposed registered borrow pit area will affect an area with very high sensitivity for the aquatic biodiversity theme and high sensitivities for the animal species and civil aviation themes. The DFFE screening tool attributes the very high aquatic biodiversity theme to the site's area supposedly falling within a strategic water source area. However, this may be attributed to the study area's situation bordering on a North West wetland CBA 2 buffer boundary (Skowno and Desmet, 2008). However, the study area does not fall within this buffer area. Stella North West does not feature on the strategic water source areas of South Africa map (Nel, 2013).

The high sensitivity of the animal species theme is attributed to a possible occurrence of an avifaunal feature – *Torgos tracheliotos*. However, the presence or signs of this species was not observed on site. With current activities on site, the likelihood of occurrence is majorly decreased. High sensitivity for civil aviation is attributed to the site's location within 8 km of other civil aviation aerodromes. However, this is not likely to affect the site's ecological functioning or borrow pit mining operations. The study site falls within areas with medium sensitivities for the agriculture, paleontology and plant species themes. Medium sensitivity of the agricultural theme is attributed to land capability being between 0.6 Low-Moderate and 0.8. Moderate. Free-roaming goats were observed on site. However, their safety is at risk with the current mining activity and open land access. Medium sensitivity of the plant species theme is attributed to the possible occurrence of sensitive species 1276 and 257. However, these sensitive species were not observed on site.

## **2. Scope and limitations of the study:**

- Perform a site sensitivity verification and evaluation for the study area's "*in situ*" environment.
- Identifying and assessing possible environmental impacts the proposed registered borrow pit could generate.

### **2.1. Assumptions and limitations:**

- This report assumes the vegetation type description was unbiased and all relevant botanical/ ecological related information was accurately described.
- Not all plants have the same growth and/or flowering period; thus, it is likely that the survey could have occurred outside of a specific species' growth and/or flowering period.
- Some geophytic and succulent plants have specialised in mimicking their surrounding habitat. Thus, some of these plants might have been overlooked due to their cryptic nature.

- Species of conservation concern (SCC) are generally uncommon and/or localised. Thus, locating such species can be challenging when attempts to locate such species occur outside the SCC's flowering season.
- Some aspects may have been overlooked because ecology is vast, dynamic, and highly complex. However, most floral communities have been accurately assessed and considered. Therefore, the information within this report is sufficient to allow informed decision-making.
- Most plant species in central South Africa experience summer rainfall, which allows for summer growth periods and summer-spring flowering season. Thus, mid-late winter is not an optimal season in which to perform vegetation surveying for this study region.

### **3. Methodology:**

#### **3.1. Verification of the *in situ* environment:**

A desktop study was performed prior to field surveys with emphasis on the following:

- Vegetation type verification
- Possible species occurrence verification
- Current land use through satellite imagery

Site verification surveys were conducted in late July 2022, focusing on ground truthing of information acquired during the desktop study. The survey was performed by means of transects traversed on foot. Attention was given to the current state of the environment regarding grazing impacts, anthropogenic disturbances, erosion and the presence of alien or invasive species. The use of an unmanned aerial vehicle (UAV) flying at a maximum altitude of 100 m was used to aid in identifying unique environmental features.

#### **3.2. Sources used for additional information:**

Vegetation:

- The South African Red List of Plants (Raimondo et al. 2009).
- Vegetation types (Mucina and Rutherford, 2006; SANBI, 2006-2018).
- The [iNaturalist](#) website was also consulted to obtain probable species presence identified by the general public.
- Field guides used for species identification (van Wyk and Malan, 1998; Botha, 2001; van Rooyen et al., 2001; Bromilow, 2010; van Wyk and van Wyk, 2013; van Oudtshoorn, 2014; Manning, 2019).

## 4. Findings:

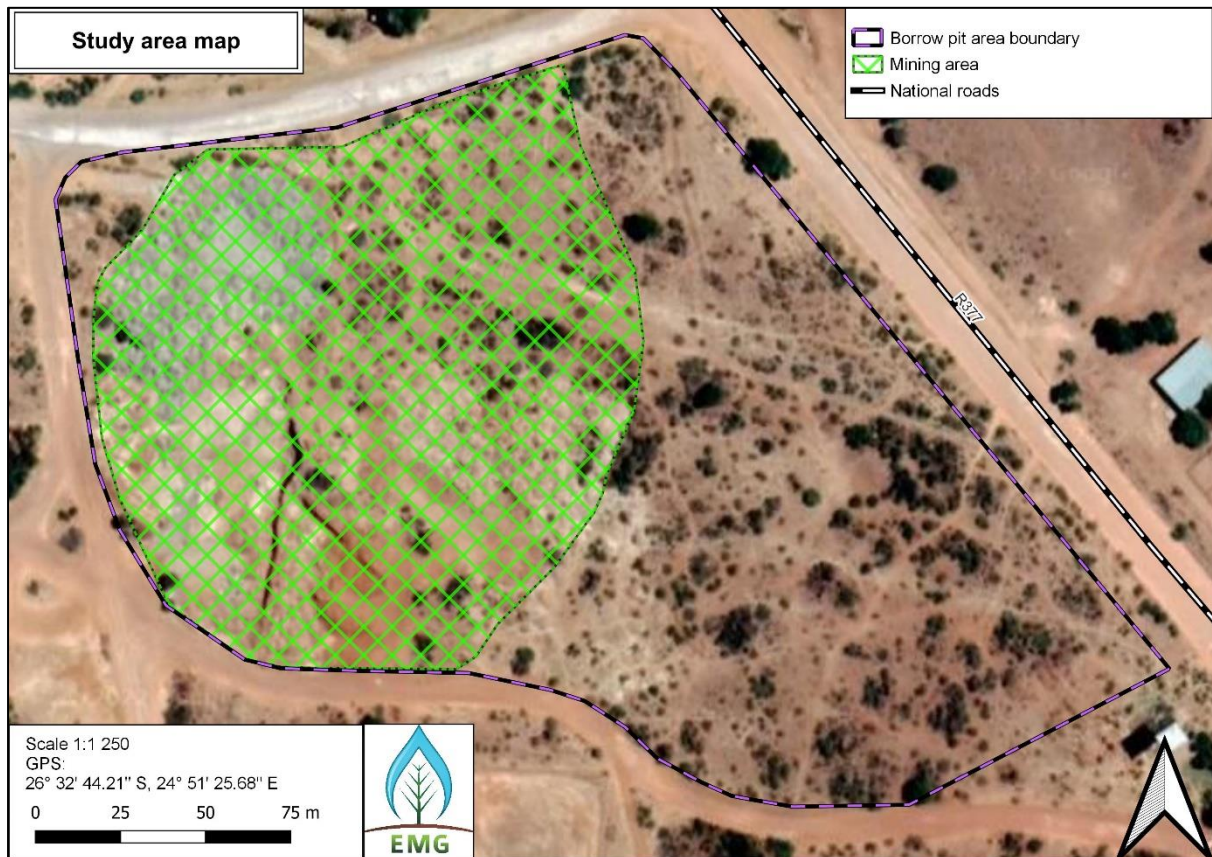


Figure 1: A study area map showing the borrow pit boundary and area which showed signs of excavation disturbances during the site visit.

### 4.1. The physical environment:

The proposed registered borrow pit is located less than 2km Northwest of Stella in the North West province. It is situated to the West of the R377 on the remaining portion 18 of Farm Biesjes Bult 549.

Overall, the area of the proposed borrow pit will be less than 5 ha on a plain of a disturbed form of open savanna vegetation.

The proposed registered borrow pit is located within the Stella Bushveld vegetation type (SVk2) (Mucina and Rutherford, 2006; SANBI, 2006-2018), found around Stella. Altitudes of this vegetation type are within 1 250-1 400 m (Mucina and Rutherford, 2006), which the study site agrees with as its altitude is 1 305-1 308 m. SVk 2's landscape is characteristically plains to slightly undulating plains (Mucina and Rutherford, 2006). The findings of this report agree with Mucina and Rutherfords' (2006) description of the physical environment at the study site.

## 4.2. Vegetation type and bioregional areas:

The proposed registered borrow pit is located within the Stella Bushveld vegetation type (Mucina and Rutherford, 2006; SANBI, 2006-2018) and is mapped within its remaining extent (SANBI & DFFE, 2021). This vegetation type is described as having an open tree and shrub layers with a well-developed herbaceous layer dominated by graminoids. *Vachellia erioloba* and *V. tortilis* are dominant trees of this vegetation type. Dominating shrubs include *Dichrostachys cinerea*, *Grewia flava*, *Tarchonanthus camphoratus*, *Vachellia hebeclada subsp. hebeclada* and *Chrysocoma cilliata*.

The findings of this report agree with the overall vegetation structure and composition described by Mucina and Rutherford (2006).

SVk 2 has a conservation status of least concern (LC) with 16 conservation targets. However, of the relatively small area (3 221.17 km<sup>2</sup>) of the vegetation type, no percent (%) of the vegetation type has been conserved (Skowno et al., 2019). This study area does not fall within any critical biodiversity areas (CBA's). However, terrestrial and aquatic CBA 2 surrounds the area surrounding the study site.

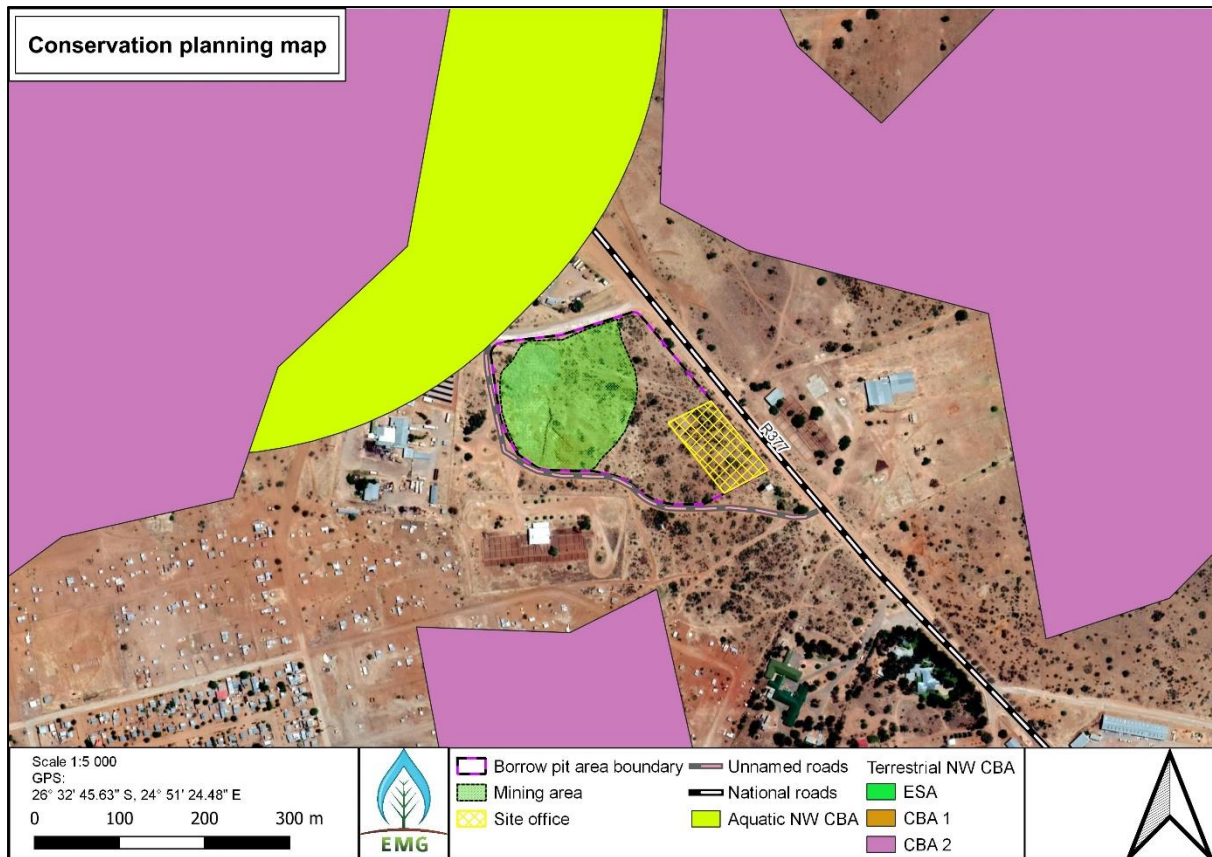


Figure 2: A map of the study area in relation to the map of the North West province's aquatic and terrestrial critical biodiversity areas.

## 4.3. Vegetation features:

The study site's physical environment and regional vegetation descriptions agree with the description of the Stella Bushveld vegetation type (Mucina and Rutherford, 2006). A comprehensive floral survey was not conducted for this report due to the site's poor ecological functioning. Severe modification of the environment within the study area

has been recorded. The environment has been severely modified through high levels of disturbance from current and historical excavation activities and other anthropogenic disturbances.

Mucina and Rutherford's (2006) vegetation type description is considered more than sufficient for reporting on the vegetation composition, condition and general appearance of the site's remaining floral elements.

According to Mucina and Rutherford (2006), the tree and shrub layers are open, with a well-developed herbaceous layer dominated by grasses. Dominant tree and shrub species are *Vachellia erioloba*, *V. tortilis* subsp. *heteracantha*, *Dichrostachys cinerea*, *Grewia flava*, *Tarchonanthus camphoratus*, *Vachellia hebeclada* subsp. *hebeclada* and *Chrysocoma ciliata*.

Ground truthing of the remaining vegetation of the study area confirms the floral elements and general appearance of Mucina and Rutherford's (2006) Stella Bushveld vegetation type.

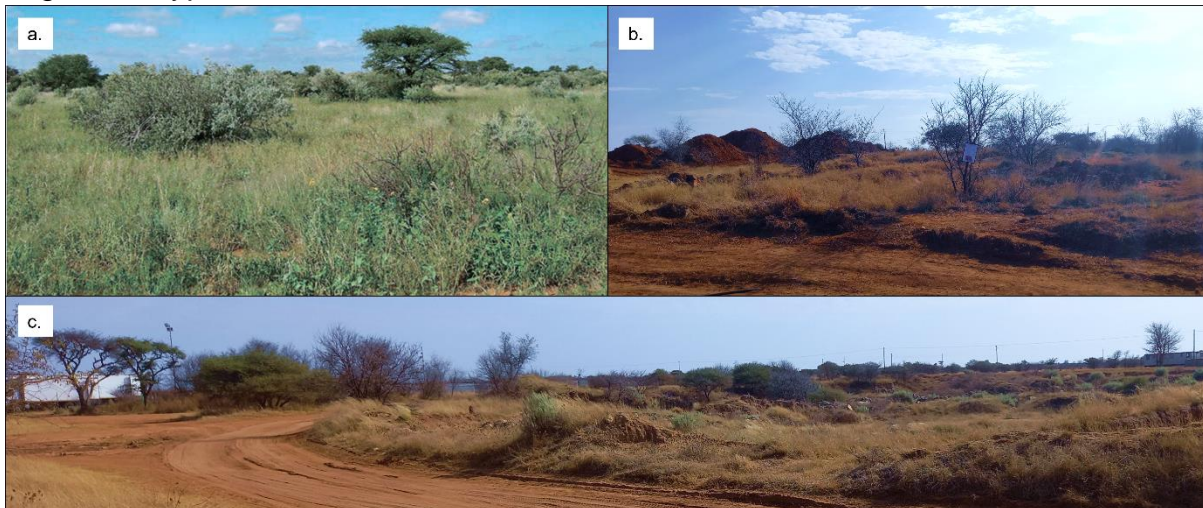


Figure 3: Ground view of the overall vegetation structure of a). SVk 2 Stella Bushveld (Mucina and Rutherford's, 2006) in the optimal growing period. b). the remaining vegetation within the study area outside of the optimal growing period. c). vegetation influenced by vegetation fragmentation and historical excavation activities.

Only one nationally protected flora was observed on site. This protected flora is a protected tree species under the National Forest Act of 1988, *Vachellia erioloba*. A removal permit can and should be obtained for this species if mining activities are expected to harm it. No confirmed or highly likely occurrence of SCC or range-restricted species were recorded for the site.

The site has less than 50% of the natural habitat, which has limited potential to support SCC remains. Site functional integrity is low due to the small area (>1-<5 ha) which is disconnected by busy road networks surrounded by discontinuous infrastructure. In addition, the sites situation amidst discontinuous infrastructure allows for increased anthropogenic contact. This contact allows for several minor ecological impacts such as trampling, illegal animal hunting/trapping, unlawful disposal of unsanitary items, litter, the introduction of alien and invasive species and disrupted general animal behaviours. Alien and invasive species were observed on site.



Figure 4: Some evidence of the minor ecological impacts observed on site. a). Trampling. b). Remnants of an illegal animal snare. c). Dumping/illegal disposal of unhygienic/unsanitary items. d). Established alien and Invasive species individuals (*Opuntia ficus-indica*) in indigenous vegetation. e). Introduction of new species of alien and invasive species by providing open space free of indigenous competitors (*Argemone ochroleuca*).

However, the site is currently experiencing major ongoing ecological impacts in the form of excavating and mining activities, which at the time of the site visit was responsible for at least 45% of the disturbance on site. Past and current excavation activities and their influences on the environment were observed within the study area.

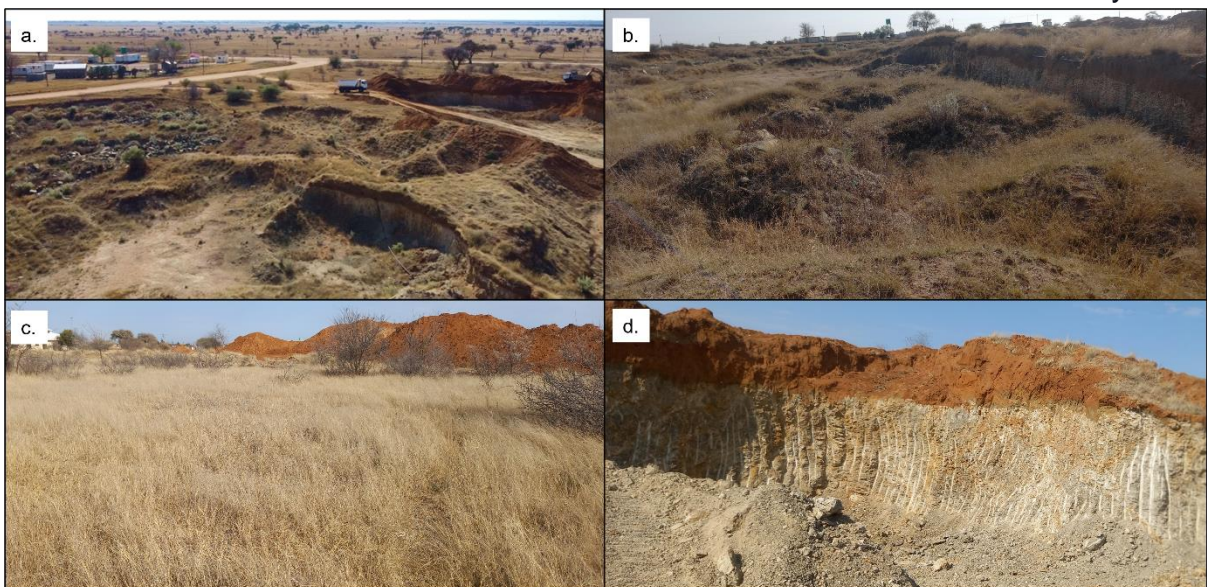


Figure 5: Evidence of current major ecological impacts. a). Aerial view of the site's current activities. b). Ground view of an abandoned part of the study area, which was the first area to be excavated within the study area. c). Ground view of topsoil stockpiles surrounding the mining area. d). View of the mining face from within the borrow pit.

## 5. Impact assessment and recommendations:

The proposed borrow pit registration will influence roughly 4.5 ha of a severely modified savanna environment. The borrow pit will influence only one individual of one nationally protected tree species. The registration of the borrow pit will, however, benefit the community and the environment. Total vegetation clearance and excavation area is expected to influence less than 5 ha due to restricted area placement of the borrow pit. Strict monitoring and the effective implementation of all

the mentioned mitigation measures will reduce the overall impact on the receiving environment.

**Table 1** Impact assessment evaluation for concerned aspects relating to the proposed registered borrow pit.

Concerned aspect	Impact evaluation pre and post mitigation		Mitigation
Habitat loss	Low	Very low	<ul style="list-style-type: none"> <li>• The borrow pit's boundary must be fenced for human and animal safety.</li> <li>• Fencing must hold warning/danger signs.</li> <li>• Access to the borrow pit area should be controlled and restricted to staff members.</li> <li>• Habitat disturbance and vegetation clearance should be restricted to the authorised area.</li> <li>• Cleared indigenous vegetation should be mulched for use in rehabilitation.</li> <li>• Removal permits need to be obtained from the relevant authority for <i>Vachellia erioloba</i>.</li> <li>• No firewood collection should be permitted.</li> <li>• Vehicle movement should strictly be kept on designated dirt/gravel roads.</li> <li>• An alien and invasive management plan should be drafted and adhered to.</li> <li>• All barren/unvegetated spaces including topsoil should be kept clear of vegetation.</li> <li>• Topsoil should be kept in stockpiles along the edge of the excavation less than 3 m high to prevent wind erosion and dust emissions</li> <li>• Topsoil should not be accidentally mixed with the material being excavated or other contaminants.</li> <li>• Alien and invasive species monitoring and eradication must take place quarterly.</li> <li>• A decommissioning and rehabilitation plan should be drafted.</li> </ul>
Loss of nationally protected flora	Very low	Very low	
Loss of floral SCC	Very low	Very low	

## 6. Conclusion:

The description of Mucina and Rutherford's (2006) SVk2 was found to be a sufficient description of the physical and vegetative characteristics of the study area's vegetation. This was found through a thorough review of literature and ground-truthing. However, the study area's environment and vegetation were found to be in a degraded

and disturbed state. The environmental impact assessment in terms of habitat and floral components is expected to be very low, with or without mitigation measures. Thus, continuing the excavations within the borrow pit area will not drastically influence the environment at the site.



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