

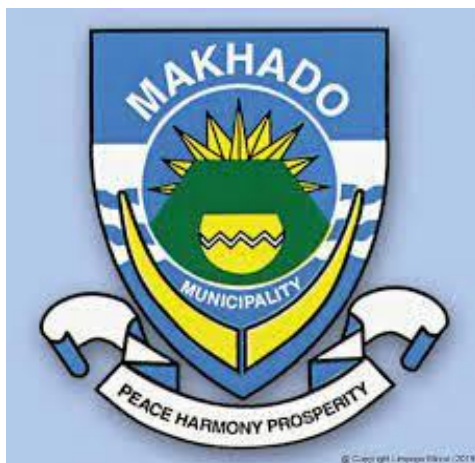


**DRAFT ENVIRONMENTAL IMPACT ASSESSMENT REPORT FOR THE PROPOSED  
TOWNSHIP ESTABLISHMENT ON PORTION 1 OF THE FARM NATURELLE LOKASIE  
272-LS, MAKHADO LOCAL MUNICIPALITY IN LIMPOPO PROVINCE.**

REF NO: 12/1/9/2-V128

NOVEMBER 2021

**PREPARED FOR:**  
Makhado Local Municipality  
Civic Center  
No 83 Krogh street  
Louis Trichardt  
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DOCUMENT CONTROL	
<b>Report Title</b>	DRAFT ENVIRONMENTAL IMPACT ASSESSMENT REPORT FOR THE PROPOSED TOWNSHIP ESTABLISHMENT ON PORTION 1 OF THE FARM NATURELLE LOKASIE 272-LS, MAKHADO LOCAL MUNICIPALITY IN LIMPOPO PROVINCE.
<b>Document ID</b>	DRAFT ENVIRONMENTAL IMPACT ASSESSMENT
<b>Client</b>	MAKHADO LOCAL MUNICIPALITY
<b>Date</b>	NOVEMBER 2021
APPROVAL:	
<b>Name</b>	PHAKWAGO M. KABELO
<b>Title</b>	ENVIRONMENTAL ASSESSMENT PRACTITIONER
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## EXECUTIVE SUMMARY

Mang Geoenviro Services was appointed by Makhado Local Municipality as an independent environmental consultancy to conduct an Environmental Impact Assessment for the proposed township establishment on portion 1 of the farm Naturelle Lokasie 272-LS, Makhado Local Municipality in Limpopo Province.

The process was registered for an EIA (Scoping) process with the Limpopo Department of Economic development, Environment and Tourism (LEDET) under Regulation 982 to 985 as amend by 324 to 327 of the National Environmental Management Act (Act No 107 of 1998) and was assigned the reference number: **12/1/9/2-V128**.

## GENERAL SITE DESCRIPTION

The proposed development is located in Tshikota Extension 3 under the Jurisdiction of Makhado local municipality, Vhembe District Municipality. The applicant is proposing to establish a new township development covering an area of approximately of 33.6 hectares in Tshikota Extension 3, Limpopo Province, and the site can be accessed through the Kganakga street from the main road (R522). The proposed township establishment is situated on portion 1 of the farm Naturelle Lokasie 272-LS which will be used for residential, business, educational, institutional, public open space and roads in Tshikota extension 3 in Limpopo.

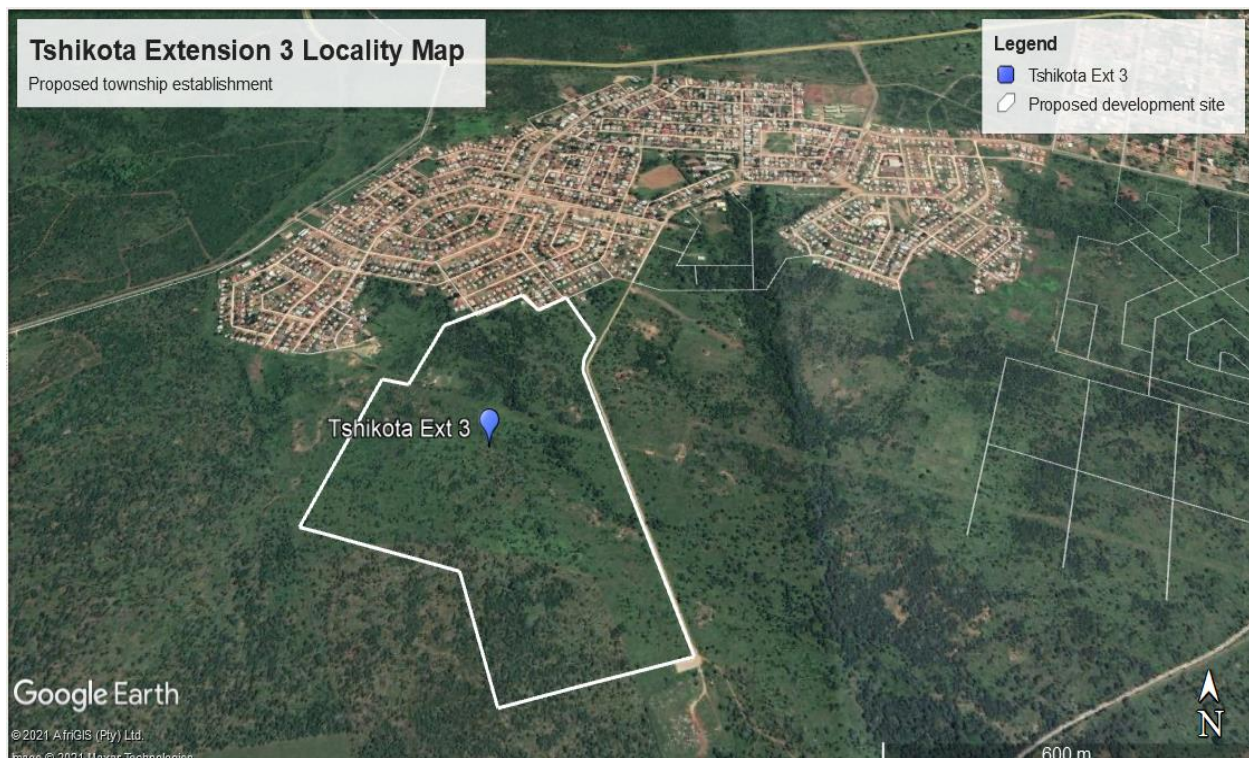


Figure 1: Locality Map



## ACRONYMS AND ABBREVIATIONS

LEDET	Limpopo Department of Economic Development, Environmental & Tourism
EMPr	Environmental Management Plan Report
NEMA	National Environmental Management Act
S&EIR	Scoping and Environmental Impact Reporting
EIAr	Environmental Impact Assessment
I&AP	Interested and Affected Parties
EIA	Environmental Impact Assessment
SAHRA	South African Heritage Resource Agency
SAHRIS	South African Heritage Resource Information Systems
HIA	Heritage Impact Assessment
TIA	Traffic Impact Assessment
EAP	Environmental Assessment Practitioner
ECO	Environmental Control Officer



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## NEMA REQUIREMENTS

In accordance with the NEMA Regulations f Chapter 5, 1998, Section 31 Environmental Impact Assessment Reports require the following:

### **Environmental Impact Assessment Reports**

*An environmental impact assessment report must contain the information that is necessary for the competent authority to consider and come to a decision on the application, and must include-*

*(a). details of-*

*(i). the EAP who prepared the report; and*

*(ii). the expertise of the EAP, including a curriculum vitae;*

*(b). the location of the activity, including:*

*(i). the 21-digit Surveyor General code of each cadastral land parcel;*

*(ii). where available, the physical address and farm name; and*

*(iii). where the required information in items (i) and (ii) is not available, the coordinates of the boundary of the property or properties;*

*(c). a plan which locates the proposed activity or activities applied for as well as the associated structures and infrastructure at an appropriate scale, or, if it is-*

*(i). a linear activity, a description and coordinates of the corridor in which the proposed activity or activities is to be undertaken;*

*(ii). on land where the property has not been defined, the coordinates within which the activity is to be undertaken;*

*(d). a description of the scope of the proposed activity, including-*

*(i). all listed and specified activities triggered and being applied for; and*

*(ii). a description of the associated structures and infrastructure related to the development;*

*(f). a motivation for the need and desirability for the proposed development, including the need and desirability of the activity in the context of the preferred location;*

*(g). a motivation for the preferred development footprint within the approved site;*

*(h). a full description of the process followed to reach the proposed development footprint within the approved site, including:*

*(i). details of the development footprint alternatives considered;*

*(ii). details of the public participation process undertaken in terms of regulation 41 of the Regulations, including copies of the supporting documents and inputs;*

*(iii). a summary of the issues raised by interested and affected parties, and an indication of the manner in which the issues were incorporated, or the reasons for not including them;*

*(iv). the environmental attributes associated with the development footprint alternatives focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects;*





- (v). the impacts and risks identified including the nature, significance, consequence, extent, duration and probability of the impacts, including the degree to which these impacts-*
  - (aa) can be reversed;*
  - (bb) may cause irreplaceable loss of resources; and*
  - (cc) can be avoided, managed or mitigated;*
- (vi). the methodology used in determining and ranking the nature, significance, consequences, extent, duration and probability of potential environmental impacts and risks;*
- (vii). positive and negative impacts that the proposed activity and alternatives will have on the environment and on the community that may be affected focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects;*
- (viii). the possible mitigation measures that could be applied and level of residual risk;*
- (ix). if no alternative development locations for the activity were investigated, the motivation for not considering such; and*
- (x). a concluding statement indicating the preferred alternative development location within the approved site;*
  - (i). a full description of the process undertaken to identify, assess and rank the impacts the activity and associated structures and infrastructure will impose on the preferred location through the life of the activity, including-*
    - (i). a description of all environmental issues and risks that were identified during the environmental impact assessment process; and*
    - (ii). an assessment of the significance of each issue and risk and an indication of the extent to which the issue and risk could be avoided or addressed by the adoption of mitigation measures;*
  - (j). an assessment of each identified potentially significant impact and risk, including cumulative impacts;*
    - (i). the nature, significance and consequences of the impact and risk;*
    - (ii). the extent and duration of the impact and risk;*
    - (iii). the probability of the impact and risk occurring;*
    - (iv). the degree to which the impact and risk can be reversed;*
    - (v). the degree to which the impact and risk may cause irreplaceable loss of resources; and*
    - (vi). the degree to which the impact and risk can be mitigated;*
- (k). where applicable, a summary of the findings and recommendations of any specialist report complying with Appendix 6 to these Regulations and an indication as to how these findings and recommendations have been included in the final assessment report;*
  - (l). an environmental impact statement which contains-*
    - (i). a summary of the key findings of the environmental impact assessment;*



- (ii). a map at an appropriate scale which superimposes the proposed activity and its associated structures and infrastructure on the environmental sensitivities of the preferred site indicating any areas that should be avoided, including buffers; and*
- (iii). a summary of the positive and negative impacts and risks of the proposed activity and identified alternatives;*
- (m). based on the assessment, and where applicable, recommendations from specialist reports, the recording of proposed impact management objectives, and the impact management outcomes for the development for inclusion in the EMPr as well as for inclusion as conditions of authorisation;*
- (n). the final proposed alternatives which respond to the impact management measures, avoidance, and mitigation measures identified through the assessment;*
- (o). any aspects which were conditional to the findings of the assessment either by the EAP or specialist which are to be included as conditions of authorisation*
- (p). a description of any assumptions, uncertainties and gaps in knowledge which relate to the assessment and mitigation measures proposed;*
- (q). a reasoned opinion as to whether the proposed activity should or should not be authorised, and if the opinion is that it should be authorised, any conditions that should be made in respect of that authorisation;*
- (r). where the proposed activity does not include operational aspects, the period for which the environmental authorisation is required and the date on which the activity will be concluded, and the post construction monitoring requirements finalised;*
- (s). an undertaking under oath or affirmation by the EAP in relation to:*
  - (i). the correctness of the information provided in the reports;*
  - (ii). the inclusion of comments and inputs from stakeholders and I&APs;*
  - (iii). the inclusion of inputs and recommendations from the specialist reports where relevant; and*
  - (iv). any information provided by the EAP to interested and affected parties and any responses by the EAP to comments or inputs made by interested or affected parties;*
- (t). where applicable, details of any financial provisions for the rehabilitation, closure, and ongoing post decommissioning management of negative environmental impacts;*
- (u). an indication of any deviation from the approved scoping report, including the plan of study, including-*
  - (i). any deviation from the methodology used in determining the significance of potential environmental impacts and risks; and*
  - (ii). a motivation for the deviation;*
- (v). any specific information that may be required by the competent authority; and*
- (w). any other matters required in terms of section 24(4)(a) and (b) of the Act.*



# 1 INTRODUCTION

Mang Geoenviro Services was appointed by Makhado Local Municipality to conduct an Environmental Impact Assessment for the proposed township establishment on portion 1 of the farm Naturelle Lokasie 272-LS in Limpopo Province. The geographical coordinates of the proposed site are: 23°3'13.28" S 29°52' 35.03" E. and the proposed development site is 33.6 hectares.

## 1.1 COMPILATION OF EIA REPORT

The following report was compiled by Mang Geoenviro Services on acceptance of the submitted scoping report and advice from the competent authority in terms of regulation 30(1)(a) to proceed with the tasks contemplated in the plan of study for environmental impact assessment, including the public participation process. The report was compiled according to regulation 31 (2)(a) – (s) of the Regulations No. 543 of 18 June 2010 promulgated in terms of Chapter 5 of the National Environmental Management Act (Act No. 107 of 1998) stipulating the information that is necessary for the competent authority to consider the application and to reach a decision contemplated in regulation 35.

## 1.2 TERMS OF REFERENCE

The objective of this study is to conduct an environmental impact assessment. The broad terms of reference for an assessment exercise are to:

- Conduct an in-depth investigation into biophysical aspects, and socio economic aspects focusing on key issues;
- Address the issues that were identified during the scoping process and investigation, which are associated with this planned project;
- Advise the proponent about the potential impacts (positive and negative impacts) of their planned development, as well as the implications for the design, construction and operational phases of the project;
- Identify possible measures to mitigate the potential impacts of the planned project;
- Address the cumulative impact of all aspects of the planned development as well as recommend possible mitigating measures.

## 1.3 INFORMATION ON THE METHODOLOGY OF EIA

This report addresses the biophysical as well as the socio-economic environments. The information was captured in the following manner:

- Site visits to determine the setting, visual character and land-uses in the area;
- I & APs were informed and consulted by phone, newspaper advertisement, emails, letters and notice boards
- Identifying positive, as well as negative issues;



- Specialist studies done by independent specialists in areas where impacts were identified;
- Making recommendations and presenting guidelines for the mitigation of impacts identified during this exercise.

## **2 ENVIRONMENTAL ASSESSMENT PRACTITIONER**

### **2.1 DETAILS OF ENVIRONMENTAL ASSESSMENT PRACTITIONER (EAP) WHO PREPARED THE REPORT**

#### **Co-Ordination, Supervision, and Report Writing:**

Phakwago M. Kabelo – Mang Geoenviro Services

#### **Public Participation**

Phakwago M. Kabelo – Mang Geoenviro Services

#### **Key Qualifications of EAP:**

- Key competencies and experience include Environmental Impact Assessments, Environmental Management Plans, Public Participation Process and Project Management.
- Registered with SACNASP (134805).

#### **Education:**

National Diploma: Environmental Sciences

## **3 PROJECT BACKGROUND**

### **3.1 Particulars of Applicant**

#### **Makhado Local Municipality**

Civic Center

No 83 Krogh street

Louis Trichardt

0920

Contact person: Mr R V Phalandwa

Tel/ Cell: 082 529 9969

E-mail: [rhudzanip@makhado.gov.za](mailto:rhudzanip@makhado.gov.za)



## 4 PROPOSED ACTIVITY

### 4.1 Location of the Proposed Activity

The proposed township establishment is situated on the southern side of Tshikota township and north of the Tshikota grave yard, west of the street to the grave yard. The site area to be developed is situated south of Tshikota township, road R522 from Makhado (formally known as Louis Trichardt) to Vivo and North of the N1 within Makhado Local Municipality, Vhembe District, Limpopo Province.

The geographical coordinates of the proposed site are: 23°3'13.28" S 29°52' 35.03" E



Figure 2 Locality Map

### 4.2 Description of Proposed Activity

The proposed township development will entail establishment of 364 sites at Tshikota Extension 3 which will include the following infrastructure-REFER TO THE LAYOUTS

- 355 Residential 1
- 3 Business 1
- 3 Educational
- 2 Public Open Space
- 1 Institutional
- Streets



An area of approximately 33.6 hectares will be utilized for the proposed township establishment in Tshikota as indicated on the layout plan below.

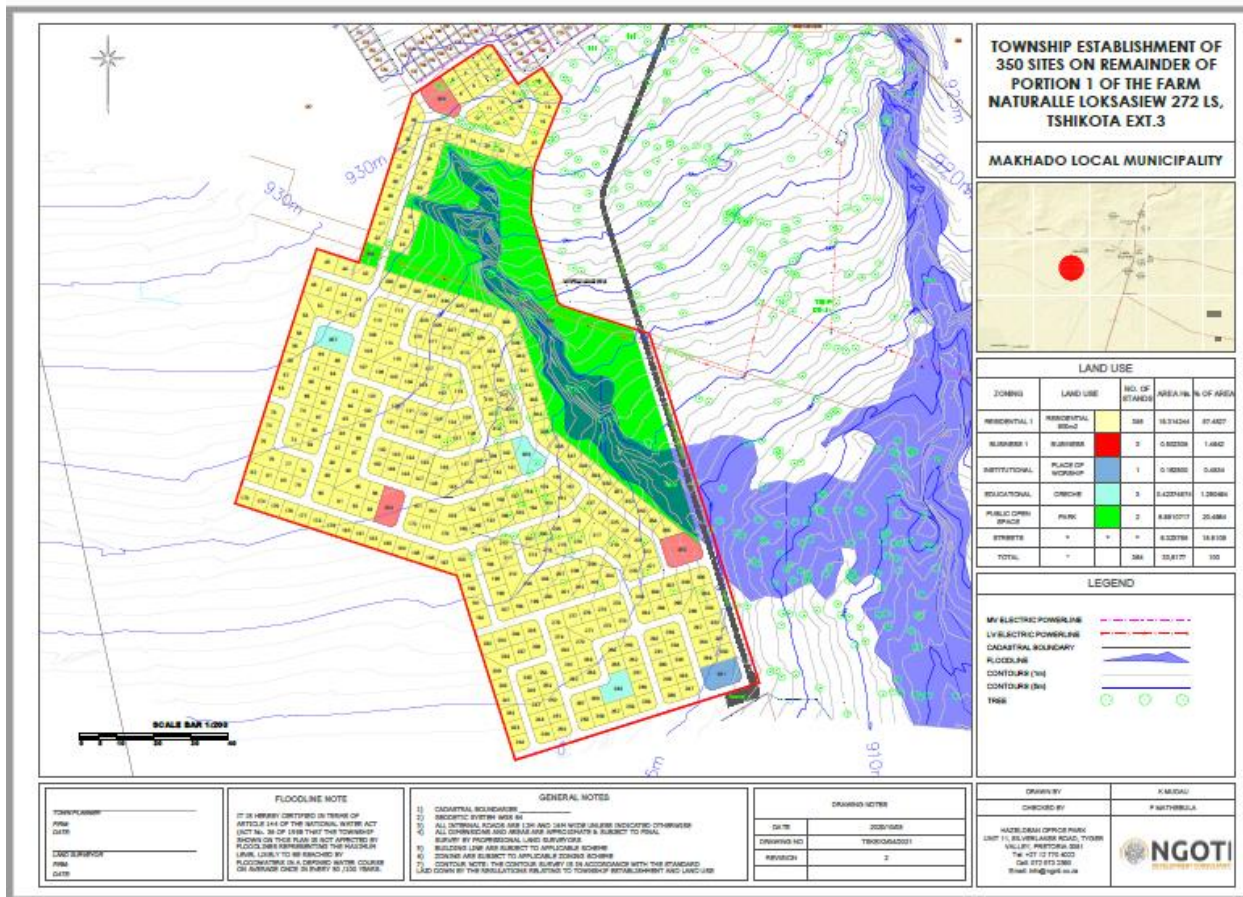


Figure 3: Layout Plan

## 5 INFRASTRUCTURE AND SERVICES

The following associated infrastructure and services are also envisaged for the development.

### 5.1 Roads

The site can be accessed from the existing adjacent streets and the paved road to the cemetery.

### 5.2 Water

The proposed development will have a water supply from the Kutama-Sinthumule bulk water supply project, from Nandoni Dam.

### 5.3 Sewer Services

There is an existing sewer bulk lines in town known as Louis Trichardt wastewater treatment, the proposed development is within the sewer basin of the sewerage of the town.



#### **5.4 Solid Waste**

The local municipality is responsible for connecting and disposing the solid waste, there is a regional landfill situated nearest to the site which can be used to dispose solid waste.

#### **5.5 Storm Water Drainage**

The stormwater system in Louis Trichardt does not reach the proposed development site. Therefore, Stormwater generated onsite can be channeled to follow the natural slope of the ground, to the lowest point.

#### **5.6 Electricity**

There is existing electricity supply infrastructure in the town and adjacent to the site. This can be utilized to supply the development, subject to approval from the power authority.

### **6 NEED AND DESIRABILITY OF PROPOSED ACTIVITY**

- The proposed development will contribute towards improving employment opportunities.
- The proposed development will increase basic services and infrastructure development in the area such as water, sanitation, transport and communication.
- There will be improvement in economic growth.

The development's location is therefore desirable due to its location in terms of:

- There will be sites for business opportunities for the residents in the surrounding area.
- Furthermore, the development will eventually be integrated with the environment, have proper service provision and it will be well planned.
- It will create job opportunities (permanent and temporary), ensure social upliftment of the area, create investment opportunities and create a sustainable development environment.
- The proposed development will not have any significant detrimental impact on the surrounding areas and is not in conflict with the adjacent land uses.

### **7 FEASIBLE AND REASONABLE ALTERNATIVES**

#### **7.1 Site Alternatives**

There is no alternative site for the proposed development, as the project area is located within the problem area and if the project is changed to another area, the problem will remain the same or unsolved.



## **7.2 Activity Alternatives**

### **7.2.1 Transport, Traffic noise and vibrations**

The major impacts that can be brought about by the development are soil erosion. Options that exist to reduce these impacts are:

- Rehabilitation of affected areas after the construction phase is finished.
- Avoiding of unnecessary vegetation clearance.
- Proper management of topsoil throughout the development.

### **7.3 Design Alternatives**

The unique character and appeal of Tshikota Ext 3 were taken into consideration with the design philosophy. Various layout alternatives were considered by the applicant and town planners, also taking terrain and environmental constraints into account, the current design plan being the result.

### **7.4 No-go option**

This option would come into effect if this assessment reveals fatal flaws in the process. To date no fatal flaws have been revealed. The no-go alternative of not developing the proposed site would leave the environment in the current state.

The no-go would not be the preferred alternative from a socio-economic perspective, as the development in general would result in a variety of employment opportunities and provide an economic boost to the area.

## **8 NEMA LISTED ACTIVITIES TO BE APPLIED FOR**

In April 2006 the Minister of Environmental Affairs and Tourism passed Environmental Impact Assessment Regulations in terms of Chapter 5 of the National Environmental Management Act, 1998 (NEMA). The regulations replaced the Environmental Impact Assessment (EIA) regulations which were promulgated in terms of the Environment Conservation Act, 1989 in 1997. The most recent regulations came into place on 18 June 2010 and, therefore, all application must be made in terms of these NEMA regulations. The purpose of this process is to determine the possible negative and positive impacts of the proposed development on the surrounding environment and to provide measures for the mitigation of negative impacts and to maximize positive impacts.

Notice No. R 982 to 985, specifically 983, 984 and 985 as amended by Notice No. R 324 to 327 list activities that must be considered in the process to be followed. The Activities listed in Notice No. R 984 as amended by 325 requires that the Scoping and EIA process be followed. However, the draft guidelines document supplied by DEAT states that if any





activity being applied for is made up of more than one listed activity and the scoping and EIA process is required for one or more of these activities, the full EIA process must be followed for the whole application.

The proposed development includes a number of listed activities and therefore it will be necessary to follow a full EIA process (as an independent process) in terms of NEMA. The applicant is therefore applying for the following listed activities.

Listed Activity	Activity Number	Description
GNR 325 of 7 April 2017	Activity 15	The clearance of an area of 20 hectares or more of indigenous vegetation, excluding where such clearance of indigenous vegetation is required for (i) the undertaking of linear activity; or (ii) maintenance purposes undertaken in accordance with a maintenance management plan.
GNR 327 of 7 April 2017	Activity 28	Residential, mixed, retail, commercial, industrial or institutional developments where such land was used for agriculture, game farming, equestrian purposes or afforestation on or after 01 April 1998 and where such development: (i) will occur inside an urban area, where the total land to be developed is bigger than 5 hectares; or (ii) will occur outside an urban area, where the total land to be developed is bigger than 1 hectare;  excluding where such land has already been developed for residential, mixed, retail, commercial, industrial or institutional purposes.

Table 1: Listed activities triggered by the development

## 9 PUBLIC PARTICIPATION

### 9.1 INTRODUCTION AND OBJECTIVES

As an important component of the EIA process, the public participation process involves public inputs from interested and affected parties (IAPs) according to Section 56 of the NEMA 2010 Regulations. I & AP may comment during the planning phase of the proposed project.

The key objectives of the public participation process are to:

- Identify a broad range of I & APs, and inform them about the proposed project;
- Understand and clearly document all issues, underlying concerns and suggestions raised by IAPs; and
- Identify areas that require further specialist investigation.



## **9.2 METHODOLOGY**

The public participation process was undertaken in accordance with the plan of study accepted in terms of Regulation 30(1). The following actions have already been undertaken as part of this process:

- Advertisement in the local newspaper
- Placement of site notices
- Distribution of Background Information Documents (BIDs) to the landowners adjacent to the proposed development site.
- Phone calls and email consultation with stakeholders

### **9.2.1 Newspaper Advertisement**

The proposed project was advertised in the local newspaper to notify people about the project and request them to register as IAPs and comment on the proposed development.

### **9.2.2 Site Notices**

Site notices were placed at various points around the site.

### **9.2.3 Background Information Documents**

Notices/ letters regarding the background information of the proposed development activity were also hand delivered to the landowners/ occupiers located next to the proposed development site.

### **9.2.4 Consultation with Stakeholders**

The scoping report was circulated to the stakeholders for observation and comments.

### **9.2.5 Comments Received**

Comments received on the scoping report are attached as part of the draft EIAR. The EIA Report is currently being circulated for comments.

## **9.3 Draft Scoping Report and the Plan of Study for EIA**

- The draft scoping report and the plan of study for EIA was submitted to LEDET on the 13th of July 2021 and acknowledged on the 15th of July 2021.
- The draft scoping report and plan of study for EIA was made available for comments to all registered I&AP's.
- No comments were received relating to the Draft Scoping report from other I&AP's.



- Verbal comments from members of the community were in favor of the proposed development
- The environmental impact assessment process will be based on the actions and findings of the scoping phase as well as the comments and reviews by authorities and from interested and affected parties.
- All documentation lists and proof of the Public Participation process were incorporated in the draft Scoping report.

#### **9.4 Final Scoping Report and the Plan of Study for EIA**

- The Final scoping report was submitted to LEDET on the 26th of August 2021, and accepted on the 04<sup>th</sup> of October 2021.
- This Final scoping report and plan of study for EIA was made available for comments to all registered I&AP's.
- Written comments were received from IAPs.
- All comments and responses to comments have been included in the EIA report.
- All documentation lists and proof of the Public Participation process were incorporated in this report.
- The environmental impact assessment process is based on the actions and findings of the scoping phase as well as the comments and reviews by authorities and from interested and affected parties.

#### **9.5 SUMMARY OF KEY ISSUES RAISED BY THE I & AP's**

No issues were raised by I&APs

## **10 ENVIRONMENTAL ASPECTS**

### **10.1 LITERATURE REVIEW**

Literature pertinent to this area and its immediate environs has been reviewed.

### **10.2 DESCRIPTION OF THE ENVIRONMENT**

#### **10.2.1 Topography**

The topography of the site is generally flat and hilly. The mainly flat slopes allow for developments without the need for massive site earthworks.

#### **10.2.2 Climate**

The climate in Tshikota is warm and temperate. In winter, there is much less rainfall than summer. The average annual temperature is 18.7°C. The rainfall in the area under investigation is around 793mm per year. The driest month is August with 9mm of rain. Most precipitation falls in January with an average of 153mm. January is warmest month of the year. The temperature in January averages 21.9°C. Moreover; in June, the average temperature is 13.4°C, it is



the lowest average temperature of the whole year. Furthermore, there is a difference of 144mm of precipitation between the driest and wettest months, with the average temperature varying during the year by 8.5°C.

### **10.2.3 Geology of the Area**

The study area covers part of the junction between the granite-greenstone terrain of the north-eastern part of the Kaapvaal Craton and the highly metamorphic rocks of the Southern Marginal zone of the Limpopo Mobile Belt.

### **10.2.4 Biodiversity**

The study area a fairly homogenous savannah biome. The site is dominated by indigenous plant species with very few exotic plant species. The site is mostly covered by juvenile plant species

### **10.2.5 Historical, archaeological or cultural sites**

A heritage specialist was appointed to assess the site and determine whether any significant material or graves are present at or near the site.

## **10.3 SUMMARY OF FINDINGS AND RECOMMENDATIONS OF SPECIALIST STUDIES AND SPECIALISED PROCESSES**

The necessary specialist studies and specialized processes have been performed in areas where possible negative impacts were identified. This was done according to Section 32 of Regulations No. R. 543 published in the Government Notice No. 33306 of 18 June 2010 of NEMA. Specialised studies relevant to the project include:

### **10.3.1 Ecological Assessment**

An ecological study was conducted to assess the area for protected and endangered plant and animal species.

#### **Details of the Specialist:**

Mveledzo Environment and Safety Solutions (PTY) LTD

Office No: 02 ENM Timber Building

Nelspruit, Mpumalanga

1200

Cell: 081 434 4234

Email: [mudaut2010@gmail.com](mailto:mudaut2010@gmail.com)



Contact Person: Takalani Mudau (Pr.Sci.Nat)

Area of expertise: Ecology Specialist.

### **Findings:**

The savannah biome is fairly Homogenous in the proposed site as well as the surrounding area, it was found that the majority of the site is recovering from an event of disturbance since majority of plant species are juveniles.

There are croplands that are flourishing very well at the site and it is dominated by indigenous plant species with exception of very few exotic plant species. There was evidence of present of birds since there are birds nest that were spotted during the site vist.

The site is a favorable location for the township activity. There is sufficient space available at the site to accommodate the development and there are no any sensitive environmental and there were no species species which falls within the protected plant category which were noted on site. The area still maintains the indigenous environment though the wood harvesting, illegal dumping and was evident.

### **Recommendations:**

- The *schlerocharia birrea* species must be avoided and be protected as practically possible, if there is no way for them to be avoided the permit from the department of Agriculture Forestry and Fisheries to relocate or to cut must requested.
- The applicant must rehabilitate and increase the conservation value of the area after the construction
- Vegetation clearing must always be kept at minimal.
- If one big plant is removed it must be replaced by four juvenile of the same species.
- If the recommendation made on the EMPr are adhered to then there will be minimal damage to the existing grassland and all associated species close to the proposed township.

### **10.3.2 Geotechnical Specialist**

A geotechnical assessment was conducted only to identify potentially adverse geotechnical conditions at the site in order to facilitate and inform the planning phase of the proposed development.

#### **Details of the Specialist:**

Mang Geoenviro Services (Pty) Ltd

Cell: 079 081 2369

Email: [j.vhethas@gmail.com](mailto:j.vhethas@gmail.com)

Contact Person: Mr Lavhesani Mavhetha (Pr.Sci.Nat)



Area of expertise: Geotechnical Specialist

#### **Findings:**

- The excavation conditions of the proposed development are categorized as soft mechanical excavation to 1.0m below existing ground level.
- No outcrops of weathered granite bedrock were encountered during the investigation on site.
- No inherent slope stability issues were identified during the field investigation. Slope stability issues are unlikely to be a problem on this site.
- Natural ground water seepage was not encountered in any of the test pits and there is no indication of temporary perched water tables in the soil profile, not even at the contact between soil and bedrock. Groundwater seepage is not expected to be problematic at shallow depths on this site.
- According to the test pit data the site is generally underlain by granite.

#### **Recommendations:**

- The majority of the removed material is likely to be suitable for re-compaction but should be tested to ensure that it meets the required standards prior to placing it back into the excavations.
- Modified normal shallow foundations may be used, with maximum bearing pressures limited to 50 kPa.
- All rainwater should be channeled away from the structures (Adequate drainage should be implemented).
- Earthworks and opening of foundations excavations should be carried out by a competent person. Laboratory testing of the collected samples indicate that the underlying soil exhibits low to medium heave potential.
- During the construction phase, it is highly recommended that qualified personnel should regularly inspect and monitor, to track and record deviations in the actual foundation conditions from those predicted as reported in this geotechnical site investigation report.
- Excavate to a minimum of 0,7 m depth to remove all the existing loose to medium dense sandy gravel, over the entire footprint of the structure and the access roads and parking areas, plus 1,5 m wider all round and replace it with material of the following specification.

#### **10.3.3 Heritage and archeological Specialist**

The purpose of this study is to identify heritage resources within a proposed development area, assess their significance, the impact of the development on the heritage resources and to provide relevant mitigation measures to alleviate impacts to the heritage resources.

**Details of Specialist:**

Vhufa Hashu Heritage Consultants  
25 Roodt Street  
Nelspruit  
1200

Tel: 083 357 3669

Fax: 086 263 5671

E-mail: [richard@vhhc.co.za](mailto:richard@vhhc.co.za)

Contact Person: Richard R Munyai

Area of expertise: Heritage and Archeology Specialist

**Findings:**

No cultural heritage (archaeological or historical) sites, features or objects were found. There is no structures/buildings on site which are older than 60 years and there are no graves identified on site.

**Recommendations:**

No further studies or mitigations are recommended due to the fact that within the proposed development site and its surroundings there are no archaeological or place of historical significance to be impacted by the proposed development. However, should any chance archaeological or any physical cultural resources be discovered, heritage authorities should be informed.

**10.3.4 Engineering and Services Specialist**

A report on the civil services, including solid waste and water options to demonstrate the provision of infrastructure required for the required township.

**Details of Specialist:**

Dalimede Projects (Pty) Ltd  
34 Jorrisen Street  
Polokwane, 0699

Tel: 079 368 8414



Fax: 086 518 0234

Email: admin@dalimede.com

Contact Person: Litmos Mthunzi

Area of expertise: Civil Engineer

## **Findings and Recommendation:**

### **Water**

Louis Trichardt town water sources is Albasini Dam, Nandoni dam on Luvuvhu River and boreholes. However, the actual water abstracted could not be confirmed in all these sources. There are existing bulk water pipelines feeding Louis Trichardt town and Tshikota areas.

The proposed development will tap-off existing water bulk lines. The proposed bulk line connection is expected to be 1km long due to the close integration of the site to existing water services. Approval to cross road servitudes will require prior approval from authorities before construction commencement.

### **Sewer Services**

The Louis Trichardt town generated wastewater is treated at the Louis Trichardt WWTW. The activated sludge plant has a design capacity of 3.6Mℓ/day. The actual sewer flow handled by this plant could not be confirmed and Makhado WWTW it is new; the plant has a design capacity of 5Mℓ/day. The actual sewer flow handled by this plant could not be confirmed. However, the received sewer flows are less than the design capacity, hence indicating availability of spare capacity of the WWTW. These plant treats the wastewater generates from the town, covering industrial, domestic, business, educational, institutional and other land uses.

The existing Tshikota sewer outfall is currently overloaded. Therefore, it is recommended to use the new proposed outfall service that is located 2.5km away from the development site.

### **Electricity**

There are existing MV feeder lines that are supplying the area. The MV line is Mink Conductor. Industrial 22kV feeder is fed from Makhado main Substation. The current loading from Makhado Substation is 5MVA. It is recommended that the township can be connected. The construction will be constructed within the township connecting the distribution transformer.

### **Stormwater drainage system**

The town has a functioning stormwater system. However, the stormwater system does not reach the proposed development. Stormwater generated onsite can be channeled to follows the natural slope of the ground, to the lowest point. It is envisioned to use Sustainable Urban Drainage Systems (SuDS) to manage stormwater runoff





from the site. It is recommended that a stormwater management plan be submitted to the municipality before construction starts.

### **Solid waste**

The solid waste generation range from 0.41 kg per capita per day in the poor areas, to 1.29 kg per capita per day.

The lower rate of 0.41kg/c/d was adopted for the township. Solid waste will be generated by the development.

It is recommended that a regional landfill situated nearest the site is used to dispose solid waste. The local municipality is responsible for connecting and disposing the solid waste.

### **10.3.5 Floodline Report**

#### **Details of Specialist:**

Dalimede Projects (Pty) Ltd  
34 Jorrisen Street  
Polokwane, 0699

Tel: 079 368 8414

Fax: 086 518 0234

Email:admin@dalimede.com

Contact Person: Litmos Mthunzi

Area of expertise: Floodline Specialist

It is recommended that a buffer zone of 20m should be provided between the 1:100 floodline area and any proposed development.

### **10.3.6 Social Impact Assessment study**

#### **Details of Specialist:**

Great Warthog Geo-Environmental Group  
No.114 Dzata Street  
Office No 004  
Vleifontein  
0948



Tel: 015 547 0524/ 082 269 4524

Email: [admin@greatwarthog.co.za](mailto:admin@greatwarthog.co.za)

Contact Person: Mr Nethononda G.L

Area of expertise: Socio-economic impact assessment

### **Findings:**

- The project area is within ward 16 of Makhado Local Municipality and has a population of 9781, which contributes just 2% of the total population of Makhado Local Municipality ward 7, which includes Tshikota Township and the study area, is a home to 14228.
- Only 29% of the population within Makhado Local Municipality is employed, majority of the population is not economic active with 49%. The unemployed and those discouraged to seek for employment make up 7% of the study area, the unemployment rate within the project area is way below the national unemployment rate.
- The majority of the people residing in the municipality speaks Tshivenda as their first language. A total of 312 915 people in the Municipality speaks Tshivenda followed by 65 561 Xitsonga speaking people.
- There are 44 public clinics and 7 mobile clinics that serve the municipality. There are 3 public hospitals in Makhado Local Municipality and only 1 private hospital.
- The project area has majority population as females with 5286 (54%) and the males in the project area account for 4495 (46%).

### **Recommendations:**

The magnitude and significance of the potential socio-economic impacts associated with the establishment of new Township at Tshikota ext 3 project outweigh the potential negative socio-economic impacts. It is therefore recommended that the development as proposed be supported by the competent authorities, subject to the implementation of the recommended enhancement and mitigation measures put forth in this report.

## **11 IMPACT ASSESSMENT**

An environmental Impact Assessment must take into account the nature, scale and duration of effects on the environment whether such effects are positive (beneficial) or negative (detrimental). Each issue / impact is also assessed according to the project stages from planning, through construction and operation to the decommissioning phase. Where necessary, the proposal for mitigation or optimization of an impact is noted.



## 11.1 Methodology to assess the Impacts

To assess the impacts on the environment, the process has been divided into two main phases namely the Construction phase and the Operational phase. The activities, products and services present in these two phases have been studied to identify and predict all possible impacts.

In any process of identifying and recognizing impacts, one must recognize that the determination of impact significance is inherently an anthropocentric concept. Duinker and Beanlands, (1986) in DEAT 2002, Thompson (1988), (1990) in DEAT 2002 stated that the significance of an impact is an expression of the cost or value of an impact to society.

However, the tendency is always towards a system of quantifying the significance of the impacts so that it is a true representation of the existing situation on site. This has been done by using wherever possible, legal and scientific standards which are applicable.

The significance of the aspects/impacts of the process have been rated by using a matrix derived from Plomp (2004) and adapted to some extent to fit this process. These matrixes use the consequence and the likelihood of the different aspects and associated impacts to determine the significance of the impacts.

Nature	<b>Classification of whether the impact is positive or negative , direct or indirect</b>
Extent	<b>Spatial scale of impact and classified as:</b> <b>Site:</b> the impacted area is the whole site or a significant portion of the site <b>Local:</b> within a radius of 2 km of the construction site. <b>Regional:</b> the impacted area extends to the immediate, surrounding and neighboring properties. <b>National:</b> the impact can be considered to be of national significance.
Duration	<b>Indicates the lifetime of the impact and is classified as:</b> <b>Short term:</b> the impact will either disappear with mitigation will be mitigated through natural processes in a span shorter than the construction phase. <b>Medium term:</b> the impact will last for the period of the construction phase, where after it will be entirely negated. <b>Long term:</b> the impact will continue or last for the entire operational life of the development, but will be mitigated by direct human action or by natural processes thereafter. The only class of impact which will be non-transitory. <b>Permanent:</b> mitigation either by man or natural process will not occur in such a way or in such a time span that the impact can be considered transient.



Intensity	<p><b>Describes whether an impact is destructive or benign</b></p> <p><b>Low:</b> impact affects the environment in such a way that natural, cultural and social functions and processes are not affected.</p> <p><b>Moderate:</b> affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way.</p> <p><b>High:</b> natural, cultural and social functions and processes are altered to extent that they temporarily cease.</p> <p><b>Very high:</b> natural, cultural and social functions and processes are altered to extent that they permanently cease.</p>
Probability	<p><b>Describes the likelihood of an impact to occur:</b></p> <p><b>Improbable:</b> likelihood of the impact materializing is very low.</p> <p><b>Possible:</b> the impact may occur.</p> <p><b>Highly probable:</b> most likely that the impact will occur.</p> <p><b>Definite:</b> the impact will occur.</p>
Significance	<p><b>Based on the above criteria the significance of issues was determined. The total number of points scored for each impact indicates the level of significance of the impact, and is rated as follows:</b></p> <p><b>Low:</b> the impacts are less important.</p> <p><b>Medium:</b> the impacts are important and require attention, mitigation is required to reduce the negative impacts.</p> <p><b>High:</b> the impacts are of great importance. Mitigation is therefore crucial.</p>
Cumulative	<p><b>In relation to an activity, means the impact of an activity that in itself may not be significant but may become significant when added to the existing and potential impacts eventuating from similar or diverse activities or undertakings in the area.</b></p>
Mitigation	<p><b>Where negative impacts are identified, mitigation measures (ways of reducing impacts) have been identified. An indication of the degree of success of the potential mitigation measures is given per impact.</b></p>

Criteria for the rating of impacts	
Criteria	Description



Extent	National	Regional	Local	Site
Duration	Permanent	Long-term	Medium-term	Short-term
Intensity	Very high	High	Moderate	Low
Probability	Definite	Highly probable	Possible	Improbable
Points allocation	4	3	2	1
Significance Rating of classified impacts				
Impact	Points	Description		
Low	4-6	A low impact has no permanent impact of significance. Mitigation measures are feasible and are readily instituted as part of a standing design, construction or operating procedure.		
Medium	7-9	Mitigation is possible with additional design and construction inputs.		
High	10-12	The design of the site may be affected. Mitigation and possible remediation are needed during the construction and/or operational phases. The effects of the impact may affect the broader environment.		
Very high	13-16	The design of the site may be affected. Mitigation and possible remediation are needed during the construction and/ or operational phases. The effects of the impact may affect the broader environment.		
Status	Perceived effect of the impact			
Positive (+)	Beneficial impact			
Negative (-)	Adverse impact			
Negative impacts are shown with a (-) while positive ones are indicated as (+)				

## 12 ASPECTS, RELATED IMPACTS, SIGNIFICANCE AND PROPOSED MITIGATION MEASURE

In this section, all the possible impacts that can be predicted in both the construction and operational phases are addressed. Specific mitigation measures are proposed and the significance of these impacts given with and without mitigation measures.



Impacts	Significance Rating Before Mitigation Measures	Proposed Mitigation Measures	Significance Rating After Mitigation Measures
<b>Planning/ Designing Phase</b>			
Poor Design – Structural failures	High (Negative)	Ensure compliance with the industry standards	Low (Negative)
Disregard of legislative requirement	High (Negative)	Ensure compliance with relevant legislation and legal standards	Low (Negative)
<b>Construction Phase</b>			
Alteration of topography due to stockpiling of soil, building material and debris and waste material on site.	Medium (Negative)	<p>All stockpiles must be restricted to designated areas and are not to exceed a height of 2 metres.</p> <ul style="list-style-type: none"> <li>• Stockpiles created during the construction phase are not to remain during the operational phase.</li> <li>• The contractor must be limited to clearly defined access routes to ensure that sensitive and undisturbed areas are not disturbed.</li> </ul>	Low (Negative)
Consumption and use of surface water for construction purposes (i.e. water tankers for dust suppression).	Medium (Negative)	The Municipality to comment and advice on surface water availability and integrity.	Low (Negative)
<p>Contaminated run-off:</p> <ul style="list-style-type: none"> <li>• Spillage of fuels, lubricants and other chemicals;</li> <li>• Inadequate stormwater management around the site; the dumping of</li> </ul>	Medium (Negative)	<ul style="list-style-type: none"> <li>• Bunded areas should be used to store chemicals.</li> <li>• Clean-up of spills as soon as they occur.</li> <li>• Keep construction activities away from the surface water resources.</li> <li>• Adequate provision of ablutions for construction employees.</li> </ul>	Low (Negative)



<p>construction material, including fill or excavated material into, or close to surface water features that may then be washed into these features;</p> <ul style="list-style-type: none"> <li>• Construction-related activities such as cement batching;</li> <li>• Construction equipment, vehicles and workshop areas will be a likely source of pollution as a non-point source; and</li> <li>• Lack of provision of ablutions that may lead to the creation of 'informal ablutions' within or close to a surface water resource.</li> </ul>		<ul style="list-style-type: none"> <li>• Wastewater must not be allowed to come into direct contact with exposed soils or run across the site. Vehicles and machinery may not be washed on site. All wastewater must be collected in a sealed container and disposed of by an approved waste contractor.</li> </ul>	
<p>Clearance of alien vegetation already present on portions of the study area.</p>	<p>Low (Positive)</p>	<p>All alien vegetation within the proposed development footprint should be removed from site and disposed of at a registered waste disposal site for the duration of construction, and continuous monitoring of seedlings need to occur until construction is complete.</p>	<p>Medium (Positive)</p>
<p>Erosion, degradation and loss of topsoil due to construction activities as well surface and stormwater run-off.</p>	<p>High (Negative)</p>	<ul style="list-style-type: none"> <li>• Minimise the clearance of vegetation to avoid exposure of soil.</li> <li>• Protect areas susceptible to erosion with mulch or a suitable alternative.</li> <li>• Implement the appropriate topsoil and stormwater runoff control management measures as per the EMPr to prevent the loss of topsoil.</li> </ul>	<p>Medium (Negative)</p>



		<ul style="list-style-type: none"> <li>• Topsoil should only be exposed for minimal periods of time and adequately stockpiled to prevent the topsoil loss and run-off.</li> </ul>	
Removal and use of local flora for firewood.	Low (Negative)	<ul style="list-style-type: none"> <li>• No cutting down of trees for firewood.</li> <li>• Utilise commercially sold wood or other sources of energy.</li> <li>• Training of contractors on environmental awareness and the importance of flora.</li> </ul>	Low (Negative)
<p>Contamination of the surface and site with general waste. General waste produced on site includes:</p> <ul style="list-style-type: none"> <li>• Office waste (e.g. food waste, paper, plastic);</li> <li>• Operational waste (clean steel, wood, glass); and</li> <li>• General domestic waste (food, cardboards, paper, bottles, tins).</li> </ul>	Low (Negative)	<p>An adequate number of general waste receptacles, including bins must be arranged around the site to collect all domestic refuse, and to minimize littering.</p> <ul style="list-style-type: none"> <li>• Bins must be provided on site for use by employees.</li> <li>• Bins should be clearly marked and lined for efficient control and safe disposal of waste.</li> <li>• Different waste bins, for different waste streams must be provided to ensure correct waste separation. A fenced area must be allocated for waste sorting and disposal on the site.</li> <li>• General waste produced on site is to be collected in skips for disposal at the local municipal waste site. Hazardous waste is not to be mixed or combined with general waste earmarked for disposal at the municipal landfill site.</li> <li>• Under no circumstances is waste to be burnt or buried on site.</li> <li>• Waste bins should be cleaned out on a regular basis to prevent any windblown waste and/or visual disturbance.</li> <li>• All general waste must be removed from the site at regular intervals and disposed of in suitable waste receptacle.</li> </ul>	Low (Negative)





<p>with general and hazardous waste. Hazardous waste produced on site includes:</p> <ul style="list-style-type: none"> <li>• Oil and other lubricants, diesel, paints, solvent;</li> <li>• Containers that contained chemicals, oils or greases; and</li> <li>• Equipment, steel, other material (rags), soils, gravel and water contaminated by hazardous substances (oil, fuel, grease, chemicals or bitumen).</li> </ul>	<p>Medium (Negative)</p>	<p>Hazardous Waste Landfill Site. The Environmental Manager must have as part of his/her records the waste manifest for each batch based disposal.</p> <ul style="list-style-type: none"> <li>• Hazardous waste bins must be clearly marked, stored in a contained area (or have a drip tray) and covered (either stored under a roof or the top of the container must be covered with a lid).</li> <li>• A hazardous waste disposal certificate must be obtained from the waste removal company as evidence of correct disposal.</li> <li>• In the case of a spill of hydrocarbons, chemicals or bituminous, the spill should be contained and cleaned up and the material together with any contaminated soil collected and disposed of as hazardous waste to minimize pollution risk.</li> </ul>	<p>Low (Negative)</p>
<p>Generation and disposal of sewage waste of temporary construction toilets.</p>	<p>Low (Negative)</p>	<ul style="list-style-type: none"> <li>• On-site chemical toilets will be provided for domestic purposes during construction phase.</li> <li>• The contractors will be responsible for the maintenance of the chemical toilets.</li> <li>• Should any spills or incidents occur; the material will be cleaned up immediately and disposed of appropriately.</li> <li>• All incidents must be reported to the responsible site officer as soon as it occurs.</li> </ul>	<p>Low (Negative)</p>
<p>Dust and emissions during construction generated by debris handling and debris piles, truck transport, bulldozing, general construction.</p>	<p>Low (Negative)</p>	<ul style="list-style-type: none"> <li>• Dust must be suppressed on the construction site and during the transportation of material during dry periods by the regular application of water. Water used for this purpose must be used in quantities that will not result in the generation of run-off.</li> </ul>	<p>Low (Negative)</p>



		<ul style="list-style-type: none"> <li>• Loads could be covered to avoid loss of material in transport, especially if material is transported off site.</li> <li>• Dust and mud should be controlled at vehicle exit and entry points to prevent the dispersion of dust and mud beyond the site boundary.</li> <li>• Facilities for the washing of vehicles should be provided at the entry and exit points.</li> <li>• A speed limit of 40 km/hr should be set for all vehicles travelling over exposed areas.</li> <li>• During the transfer of materials, drop heights should be minimized to control the dispersion of mater being transferred.</li> <li>• The height of all stockpiles on site should be a maximum of 2m. Use of dust retardant road surfacing if made necessary due to the exceedance of Air Quality Guidelines.</li> </ul>	
Generation of fumes from vehicle emissions may pollute the air.	Low (negative)	<ul style="list-style-type: none"> <li>• All earth moving vehicles and equipment must be regularly maintained to ensure their integrity and reliability in order to prevent smoke emissions</li> </ul>	Low (Negative)
During the construction phase there is likely to be an increase in noise pollution from construction vehicles and construction staff.	Medium (negative)	<ul style="list-style-type: none"> <li>• All construction activities should be undertaken according to daylight working hours between the hours of 07:00 – 17:00 on weekdays and 7:30 – 13:00 on Saturdays.</li> <li>• No construction activities may be undertaken on Sunday.</li> <li>• Provide all equipment with standard silencers. Maintain silencer units in vehicles and equipment in good working order.</li> <li>• All earth moving vehicles and equipment must be regularly maintained to ensure their integrity and reliability.</li> </ul>	Low (Negative)



		<ul style="list-style-type: none"> <li>• Construction staff working in area where the 8-hour ambient noise levels exceed 60 dBA must have the appropriate Personal Protective Equipment (PPE).</li> <li>• All operations should meet the noise standard requirements of the Occupational Health and Safety Act (Act No. 85 of 1993).</li> </ul>	
Disturbance of sites of archaeological, historical and cultural significance.	Low (negative)	<ul style="list-style-type: none"> <li>• There were no sites or objects of archaeological, historical and cultural significance identified, however, if during construction any possible finds are made, the operations must be stopped and a qualified archaeologist be contacted for an assessment of the find.</li> <li>• It is advisable that an information section on cultural resources be included in the SHEQ training given to contractors involved in surface earthmoving activities. These sections must include basic information on:</li> <li>• The archaeologist needs to evaluate the finds on site and make recommendations towards possible mitigation measures.</li> </ul>	Low (Negative)
During the construction phase there is likely to be an increase in traffic from construction vehicles.	Medium (Negative)	<ul style="list-style-type: none"> <li>• Construction vehicles are to avoid main roads during peak traffic hours.</li> <li>• All vehicles entering the Site are to be roadworthy.</li> <li>• Seatbelts are to be worn at all times.</li> <li>• When using heavy or large vehicles / equipment, “spotters” are to be present to assist the driver with his blind spots.</li> <li>• Any incident or damage to a vehicle must be reported immediately.</li> </ul>	Low (Negative)



The development will result in job creation and provision of employment.	Medium (Positive)	<ul style="list-style-type: none"> <li>• All labour (skilled and unskilled) and contractors should be sourced locally where possible.</li> <li>• A labour and recruitment policy must be developed, displayed and implemented by the contractor.</li> <li>• Recruitment at the construction site will not be allowed.</li> <li>• Where possible, labour intensive practices (as opposed to mechanised) should be practiced.</li> <li>• The principles of equality, BEE, gender equality and non-discrimination will be implemented.</li> </ul>	High (Positive)
Job creation during the construction phase could result in the influx of people to the area.	Medium (positive)	<ul style="list-style-type: none"> <li>• If possible all labour should be sourced locally.</li> <li>• Contractors and their families may not stay on site.</li> <li>• No informal settlements will be allowed.</li> </ul>	High (Positive)
Public safety during construction.	Medium (Negative)	<ul style="list-style-type: none"> <li>• Members of the public adjacent to the construction site should be notified of construction activities in order to limit unnecessary disturbance or interference.</li> <li>• Construction activities will be undertaken during daylight hours and not on Sundays.</li> </ul>	Medium (Negative)
Construction staff safety during construction.	High (Negative)	<ul style="list-style-type: none"> <li>• Ensure the appointment of a Safety Officer to continuously monitor the safety conditions during construction.</li> <li>• All construction staff must have the appropriate PPE.</li> <li>• The construction staff handling chemicals or hazardous materials must be trained in the use of the substances and the environmental, health and safety consequences of incidents.</li> </ul>	Medium (Negative)



		<ul style="list-style-type: none"> <li>Report and record any environmental, health and safety incidents to the responsible person.</li> </ul>	
<b>Operational Phase</b>			
Leaks of untreated water from pipelines may occur and impact on the shallow groundwater quality.	Medium (Negative)	<ul style="list-style-type: none"> <li>Any leaks should be fixed immediately and areas rehabilitated as needed.</li> </ul>	Low (Negative)
Increased urban run-off from urban infrastructure and roads.	Low (Negative)	<ul style="list-style-type: none"> <li>The stormwater management plan must be implemented.</li> </ul>	Low (Negative)
Emergency evacuation plan	Low (Negative)	<ul style="list-style-type: none"> <li>Upon completion of the construction phase, an emergency evacuation plan must be drawn up to ensure the safety of the land users in the case of an emergency.</li> </ul>	Low (Negative)
Increase in Environmental Degradation & Pollution	Low (Negative)	<ul style="list-style-type: none"> <li>Prevent any influx of run-off water (from residences) or effluent into wetland habitat.</li> <li>Run-off water from gardens typically contains seeds of exotic and garden-variety plants that pose a threat to wetland vegetation and ecology. Run-off water should be diverted to storm water management services and infrastructures;</li> </ul>	Low (Negative)
Generation and disposal of domestic waste by the proposed development.	Medium (Negative)	Waste will be collected by an accredited waste company and disposed of at an appropriate and licensed waste disposal facility.	
The development will result in job creation and provision of employment.	Medium (Positive)	<ul style="list-style-type: none"> <li>The principles of gender equality, maximizing local employment should be implemented in the provision and establishment of jobs.</li> <li>Jobs for the maintenance of infrastructure and services will be created following the completion of the development. These jobs might be</li> </ul>	Medium (Positive)



		<p>made available to existing labour there creating long term employment.</p> <ul style="list-style-type: none"> <li>• Service contractors could have access to other developments or projects in the area thereby creating long term employment</li> </ul>	
Dust from cleared areas	Medium (Negative)	<ul style="list-style-type: none"> <li>• Exposed soil surfaces should be wet down where required to avoid dust emissions.</li> <li>• Vehicles transporting construction material such as building sands should remain at a speed limit of 40km/h and if required cover their loads with a tarpaulin to avoid dust emissions.</li> <li>• The height of stockpiles should be limited to 1.5m.</li> <li>• Newly cleared and exposed areas must be managed for dust and landscaped with indigenous vegetation to avoid soil erosion. Where necessary, temporary stabilization measures must be used until vegetation establishes.</li> </ul>	Low (Negative)
Increase in soil erosion	Low (Negative)	<ul style="list-style-type: none"> <li>• All reasonable measures should be implemented during the Operational Phase to minimise erosion.</li> <li>• Remedial action must be taken at the first signs of erosion.</li> </ul>	Low (Negative)
<b>Decommissioning Phase</b>			
Due to the permanent nature of the development, no decommissioning is foreseen. If the project is to be decommissioned the same mitigations contained in the construction phase will apply.			



## 13 KEY ENVIRONMENTAL IMPACTS

The following possible environmental impacts were identified

Environmental issues	Possible cause	Potential impacts
<b>Air Pollution and Noise</b>		
Smoke	<ul style="list-style-type: none"> <li>- Vehicle emissions.</li> <li>- Fires.</li> </ul>	<ul style="list-style-type: none"> <li>- Health problems.</li> <li>- Air pollution.</li> <li>- Public nuisance.</li> <li>- Noise pollution.</li> </ul>
Dust	<ul style="list-style-type: none"> <li>- During construction.</li> <li>- Vehicle operation on roads.</li> <li>- Vegetation clearing.</li> </ul>	
Fumes	<ul style="list-style-type: none"> <li>- Fumes from vehicles.</li> <li>- Fumes from machinery.</li> </ul>	
Noise	<ul style="list-style-type: none"> <li>- Construction machinery and vehicles.</li> <li>- Presence of construction camp.</li> <li>- Operation noise (music and people).</li> </ul>	
Environmental issues	Possible cause	Potential impacts
<b>Water quality</b>		
Pollution of water sources	<ul style="list-style-type: none"> <li>- Spillage of fuel &amp; oil from vehicles.</li> <li>- Spillage of building material e.g. cement etc.</li> <li>- Migration of contaminants off the site.</li> <li>- Solid waste in storm water.</li> <li>- Littering.</li> </ul>	<ul style="list-style-type: none"> <li>- Pollution of surface and groundwater.</li> <li>- Health risk.</li> <li>- Lower water quality.</li> <li>- Soil degradation.</li> <li>- Erosion.</li> <li>- Siltation.</li> </ul>
Silt deposition in surface water	<ul style="list-style-type: none"> <li>- Erosion risk due to increased run-off from built up area.</li> <li>- Erosion from cleared areas during construction.</li> </ul>	
Pollution from sanitation system	<ul style="list-style-type: none"> <li>- Leakages of system and incorrect management of sanitation system.</li> <li>- Inadequate measures to prevent sewage spillages.</li> </ul>	



	- Overflow of sewage to groundwater.	
<b>Environmental issues</b>	<b>Possible cause</b>	<b>Potential impacts</b>
<b>Water quantity</b>		
Impact on amount of water resources Available	Over-utilisation of available water.	<ul style="list-style-type: none"> <li>- Lose scarce resource</li> <li>- Increased pressure on ground water supply sources.</li> </ul>
<b>Environmental issues</b>	<b>Possible cause</b>	<b>Potential impacts</b>
<b>Land/Soil degradation</b>		
Soil contamination and degradation	<ul style="list-style-type: none"> <li>- Spillages of oil, chemicals from machinery &amp; vehicles.</li> <li>- Removal of vegetation during clearing for construction.</li> <li>- Sewerage spillages.</li> <li>- Erosion due to increased runoff from built-up areas.</li> <li>- Increased erosion of drainage channels.</li> <li>-Site clearing during construction.</li> </ul>	<ul style="list-style-type: none"> <li>- Soil degradation</li> <li>- Loss of topsoil</li> <li>- Dust formation</li> <li>- Erosion</li> </ul>
<b>Environmental issues</b>	<b>Possible cause</b>	<b>Potential impacts</b>
<b>Biodiversity</b>		
Decline in fauna and flora diversity	<ul style="list-style-type: none"> <li>- Cleaning of site for construction.</li> <li>- Pollution of soil.</li> <li>- Pollution of water resources.</li> <li>- Physical establishment of development.</li> <li>- Loss of habitat due to establishment of development.</li> </ul>	<ul style="list-style-type: none"> <li>- Loss of biodiversity.</li> <li>- Loss of habitat.</li> <li>- Negative impact on biodiversity.</li> <li>- Negative impact on rare /endangered/ endemic species and habitats.</li> </ul>
<b>Environmental issues</b>	<b>Possible cause</b>	<b>Potential impacts</b>
<b>Cultural/Heritage</b>		
Possible loss of heritage sites	- Damage / loss during construction.	- Possible loss of cultural heritage.





	- Damage / loss during operation.	
<b>Visual impact</b>		
Impact of the proposed development of sense of place.	- The physical existence of the development.	- Negative impact on landscape quality character. - Negative impact on sense of place.
Visual impact	- Construction site and buildings. - Lights at night. - Presence of new development. - Overhead power lines.	- Obstruction. - Visual intrusion. - Public nuisance.
<b>Health and Safety</b>		
Security	- Influx of people to area including construction workers and others after completion.	- Loss of safe and secure environment.
Fires	- Accidental fires. - Burning of waste. - Cooking with fires.	- Threat to health. - Danger to human life.
<b>Socio-economic impacts</b>		
Impact from change of land use from agriculture to township.	- Change of land use to business, Motor sales and streets/roads.	- Impact negatively on agricultural production. - Land will no longer be used for agriculture.
Impact of the residential and other development on adjacent landowners	- Noise from construction activities, - Dust generated by construction vehicles and from site preparation. - The visual impact of lights. -The visual impact of residential and other units (business, institutional etc.)	- Nuisance and disruption. - Noise pollution. - Air pollution. - Negative visual impact.



<p>Impacts related to the establishment of a construction camp with accommodation</p>	<ul style="list-style-type: none"> <li>- Location of construction camp.</li> <li>- Environmental impacts of construction activities e.g. spillage of hazardous liquids such as oil and fuel onto the soil surface.</li> <li>- Accommodation of construction teams on site</li> <li>- Littering, accidental fires, collecting of firewood and poaching.</li> <li>- Undesirable visitors to the area.</li> </ul>	<p>Adverse impact on the environment.</p> <ul style="list-style-type: none"> <li>- Resentment from neighboring residents.</li> </ul>
<p>Impact ground and water pollution from littering and waste disposal during construction and operational Phases</p>	<ul style="list-style-type: none"> <li>- The presence of a large work force and equipment and machinery during construction causing littering and dumping refuse and builder's rubble on site.</li> <li>-Construction activities from heavy vehicles and machinery.</li> </ul>	<ul style="list-style-type: none"> <li>- Soil and water pollution</li> </ul>
	<ul style="list-style-type: none"> <li>- The construction of structures such as open trenches and earth heaps might also hold safety risks for people.</li> </ul>	<ul style="list-style-type: none"> <li>- Safety risks for motorists, passengers, pedestrians and residents of the area</li> </ul>
	<ul style="list-style-type: none"> <li>- A lack of proper ablution facilities for temporary workers during construction.</li> </ul>	<ul style="list-style-type: none"> <li>- Soil and water pollution</li> <li>- Unhygienic conditions</li> <li>- Health risk.</li> </ul>
<p>Impact from the provision of structures and infrastructure services</p>	<ul style="list-style-type: none"> <li>- The development, construction and provision of infrastructure services.</li> </ul>	<ul style="list-style-type: none"> <li>- Pollution from sanitation systems</li> <li>- Pollution of water resources.</li> <li>- Negative visual impact of overhead power lines and electricity supply and waste removal.</li> <li>- Soil erosion as a result of the construction of internal roads and water reticulation networks.</li> </ul>



Impact on archaeological /cultural / social features	<ul style="list-style-type: none"> <li>- The development of structures and infrastructure services for residential and other sites.</li> <li>- Clearing of construction sites.</li> <li>- Construction of access roads.</li> <li>- Excavation of trenches for the installation of underground pipelines and cables.</li> </ul>	- Negative impact on cultural or heritage resources.
Job creation Ownership	<ul style="list-style-type: none"> <li>- Temporary jobs during construction phase.</li> <li>- Permanent jobs during operation.</li> <li>- New businesses.</li> </ul>	<ul style="list-style-type: none"> <li>- Positive impact</li> <li>- job Creation.</li> </ul>

## 14 ASSUMPTIONS, UNCERTAINTIES AND GAPS IN KNOWLEDGE

- In this report it is assumed that the developer will act responsibly taking the environment into consideration at all times.
- It is assumed that the applicant will ensure that the mitigation measures in this report are complied with and that all monitoring and maintenance requirements will be followed closely.
- It is assumed that the development will stay within the ambit of the design of the development - it may be smaller with the result of fewer impacts.
- It is also assumed that this EIA Report will be sufficient to make an informed decision with regard to granting environmental authorization.
- All issues identified during the EIA process are addressed in the EIA Report and specialist studies.

## 15 AUTHORISATION OF ACTIVITY AND CONDITIONS

The purpose of this report is to provide the relevant authority with sufficient information regarding the potential impacts of the development to make an informed decision regarding the approval of the Environmental Impact Assessment report. Potential impacts were identified in consultation with I&AP's and technical specialists (where applicable) and were assessed using a matrix and by applying professional knowledge.

The potentially significant negative and positive impacts that have been identified should be mitigated through the implementation of the mitigation measures contained in this report.

Impacts with a rating of Medium-high or High are impacts which are regarded as potentially significant, rated without any mitigation measures. In this impact assessment, the following impacts were regarded as potentially significant impacts:



- i. Increased water use during the construction phase.
- ii. Planting indigenous, rare and endangered species and rehabilitation (POSITIVE).
- iii. The socio-economic impact for creating temporary and permanent jobs (POSITIVE).
- iv. The socio-economic impact of new business opportunities (POSITIVE).

It is submitted that the proposed mitigation measures, will effectively diminish the impacts to acceptable levels. Given the socio-economic requirements of the development, the residual impacts are not of sufficient importance to prevent the development.

It is the professional opinion of Mang Geoenviro Services that the proposed development does not present any fatal flaws in terms of negative impacts to the environment and therefore will not have any significant detrimental impacts to render the project unfeasible.

The Department is therefore respectfully requested to evaluate this Impact Assessment Report, as part of an application that has been lodged in terms of Chapter 5 of the National Environment Management Act, 1998(Act no 107 of 1998), in respect of the activities identified in Government Notices R545.

It is proposed that the following conditions must be included in the Environmental Authorisation if the project is authorised:

- The mitigation measures contained in this report must be implemented.
- The management and or mitigation measures contained in the Environmental Management Programme must be implemented.
- A detailed engineering geological investigation must be conducted at the sites of buildings PRIOR, to any construction activities on site.
- The responsibilities to obtain any further authorisations and/or licenses will rest on the proponent of the project, PRIOR to any activities on site.

## 16 CONCLUSION

The development proposal has no fatal flaws in terms of the institutional, bio-physical or socio-economic environments. In fact, it is believed that the proposed development compliments the required and desired balance to be achieved between socio-economic and ecological / environmental factors.

The Environmental Management Programme (EMPr) and all the mitigation measures addressed in all the specialist reports should be strictly adhered to, therefore mitigating impacts as far as possible. Should this site not be developed, it will remain as an isolated and unconnected land area that will be vulnerable to crime and potential illegal informal occupation.



## 17 RECOMMENDATIONS

It is recommended that this application be approved with the following conditions:

- All requirements from the Makhado Local Municipality be adhered to including:
- All other state departments' comments and input be adhered to
- The conditions of the Environmental Authorization from the competent authority (LEDET).
- The EMP conditions as attached to this document.
- An Environmental Control Officer (ECO) should be appointed to audit the Environmental Management Programme on a bi-weekly basis during construction phase.

## APPENDICES

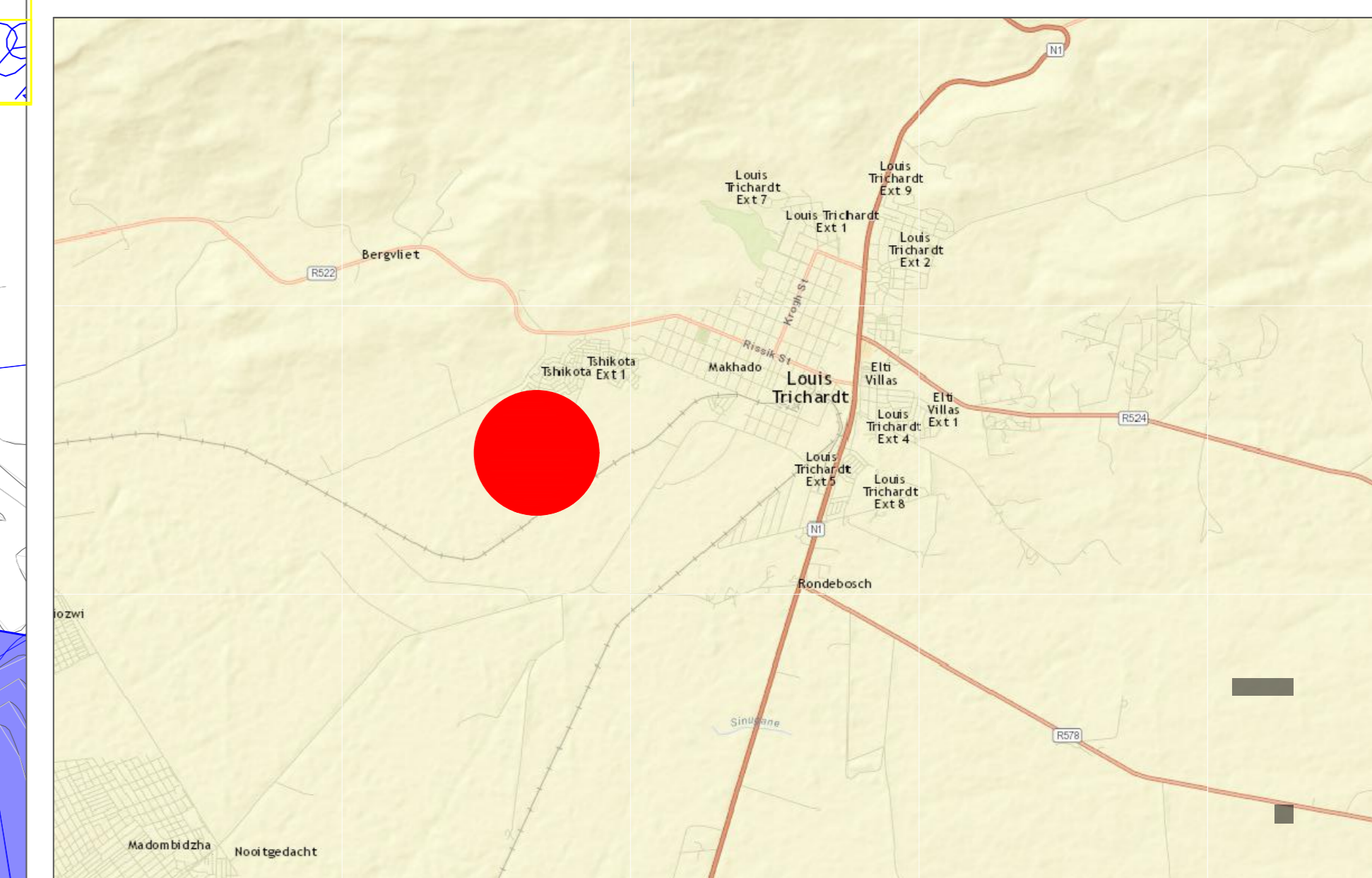
## Appendix A – Locality Map

## Appendix B – Layout Plan



# TOWNSHIP ESTABLISHMENT OF 350 SITES ON REMAINDER OF PORTION 1 OF THE FARM NATURALLE LOKASIEW 272 LS, TSHIKOTA EXT.3

## MAKHADO LOCAL MUNICIPALITY

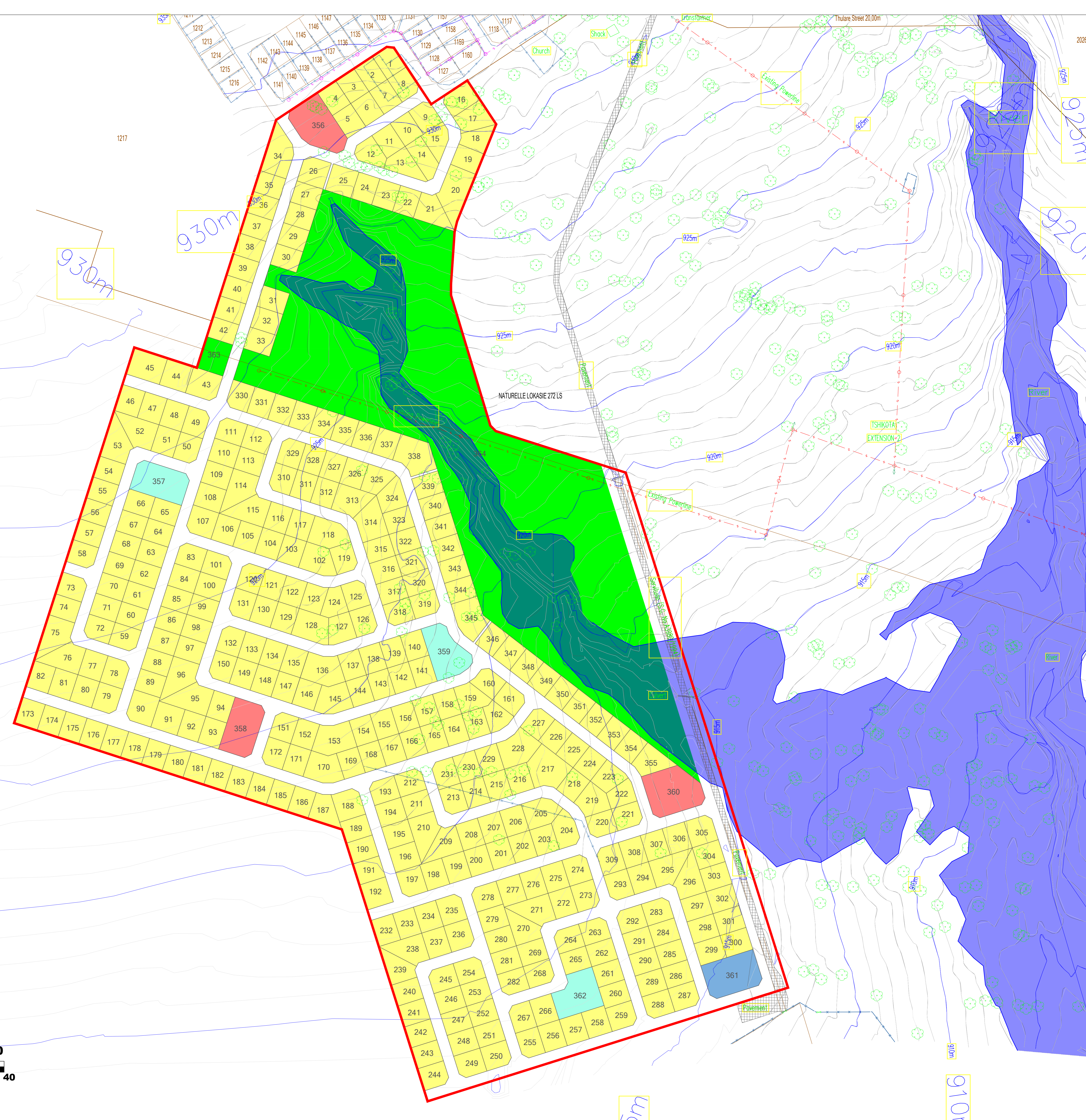


### LAND USE

ZONING	LAND USE	NO. OF STANDS	AREA Ha.	% OF AREA
RESIDENTIAL 1	RESIDENTIAL 900m2	355	19.314244	57.4527
BUSINESS 1	BUSINESS	3	0.502308	1.4942
INSTITUTIONAL	PLACE OF WORSHIP	1	0.162500	0.4834
EDUCATIONAL	CRECHE	3	0.42374874	1.260494
PUBLIC OPEN SPACE	PARK	2	6.8910717	20.4984
STREETS	*	*	6.323795	18.8109
TOTAL	*	364	33.6177	100

### LEGEND

MV ELECTRIC POWERLINE	
LV ELECTRIC POWERLINE	
CADASTRAL BOUNDARY	
FLOODLINE	
CONTOURS (1m)	
CONTOURS (5m)	
TREE	



SCALE BAR 1:200



#### FLOODLINE NOTE

IT IS HEREBY CERTIFIED IN TERMS OF ARTICLE 144 OF THE NATIONAL WATER ACT (ACT No. 36 OF 1998 THAT THE TOWNSHIP SHOWN ON THIS PLAN IS NOT AFFECTED BY FLOODLINES REPRESENTING THE MAXIMUM LEVEL LIKELY TO BE REACHED BY FLOODWATERS IN A DEFINED WATER COURSE ON AVERAGE ONCE IN EVERY 50 /100 YEARS.

#### GENERAL NOTES

- CADASTRAL BOUNDARIES
- GEODETIC SYSTEM WGS 84
- ALL INTERNAL ROADS ARE 12M AND 16M WIDE UNLESS INDICATED OTHERWISE
- ALL DIMENSIONS AND AREAS ARE APPROXIMATE & SUBJECT TO FINAL SURVEY BY PROFESSIONAL LAND SURVEYORS
- BUILDING LINE ARE SUBJECT TO APPLICABLE SCHEME
- ZONING ARE SUBJECT TO APPLICABLE ZONING SCHEME
- CONTOUR NOTE: THE CONTOUR SURVEY IS IN ACCORDANCE WITH THE STANDARD LAID DOWN BY THE REGULATIONS RELATING TO TOWNSHIP ESTABLISHMENT AND LAND USE

#### DRAWING NOTES

DATE	2020/10/05
DRAWING NO	TSKEX3/04/2021
REVISION	2

TOWN PLANNER  
FIRM:  
DATE:

LAND SURVEYOR  
FIRM:  
DATE:

DRAWN BY

K MUDAU

CHECKED BY

F MATHEBULA

HAZELDEAN OFFICE PARK  
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Tel: +27 12 770 4022  
Cell: 072 573 2390  
Email: info@ngoti.co.za



## Appendix C – Details of the EAP

## Appendix D – Specialist Report

**PROJECT DETAILS**

**PROJECT TITLE: BIODIVERSITY STUDY FOR THE EIA APPLICATION FOR THE PROPOSED DERMACATION OF 300 SITES AT TSHIKOTA TOWNSHIP ON THE REMAINDER OF THE FARM NATURELLE LOKSASIE 277 LS IN TSHIKOTA TOWNSHIP MAKHADO LOCAL MUNICIPALITY, LIMPOPO PROVINCE**

**Project Number: Biodiversity 002**

**Compiled by: Takalani Mudau**

**Compiled for: Mang Geo-Enviro Services**

**Date: 1 July 2021**

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**Takalani Mudau- (Pr. Sci. Nat)**

**BSc (Hons) Botany – Univen**

**For Mveledzo Environmental and Safety Solutions Pty Ltd**

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## **DEFINITIONS**

### **Environment**

The surroundings (biophysical, social and economic) within which humans exist and that are made up of

- the land, water and atmosphere of the earth;
- micro-organisms, plant and animal life;
- any part or combination of (i) and (ii) and the interrelationships among and between them; and,
- the physical, chemical, aesthetic and cultural properties and conditions of the foregoing that influence human health and wellbeing.

### **Environmental Aspects**

Elements of an organization's activities, products or services that can interact with the environment.

### **Environmental Degradation**

Refers to pollution, disturbance, resource depletion, loss of biodiversity, and other kinds of environmental damage; usually refers to damage occurring accidentally or intentionally as a result of human activities.

### **Environmental Impacts**

Any change to the environment, whether adverse or beneficial, wholly or partially resulting from an organization's activities, products or services.

### **Environmental Impact Assessment**

A systematic process of identifying, assessing and reporting environmental impacts associated with an activity and includes basic assessment and Scoping and EIR (NEMA EIA Regulations).

### **Environmental Impact Report**

A report assessing the potential significant impacts as identified during the environmental impact assessment.

### **Land use**

The various ways in which land may be employed or occupied. Planners compile, classify, study and analyse land use data for many purposes, including the identification of trends, the forecasting of space and infrastructure requirements, the provision of adequate land area for necessary types of land use, and the development or revision of comprehensive plans and land use regulations.

### **Pollution Prevention**

Any activity that reduces or eliminates pollutants prior to recycling, treatment, control or disposal.

### **Public Participation Process**

A process of involving the public in order to identify needs, address concerns, in order to contribute to more informed decision making relating to a proposed project, programme or development.

### **Topography**

Topography, a term in geography, refers to the "lay of the land" or the physio-geographic characteristics of land in terms of elevation, slope and orientation.

### **Vegetation**

All of the plants growing in and characterizing a specific area or region; the combination of different plant communities found there.

### **Waste**

Waste is unwanted or undesired material left over after the completion of a process. "Waste" is a human concept: in natural processes there is no waste, only inert end products.

### **Alternatives**

Alternatives are different means of meeting the general purpose and need of a proposed activity. Alternatives may include location or site, activity, process or technology, or the no-go alternative.

### **Cumulative Impacts**

Impacts that result from the incremental impact of the proposed activity on a common resource when added to the impacts of the other past, present or reasonably foreseeable future activities. Cumulative impacts can occur from the collective impacts of individual minor actions over a period and can include both direct and indirect impacts.

### **Direct impacts**

Impacts that are caused directly by the activity and generally occur at the same time and at the place of the activity (e.g. noise generated by blasting operations on the site of activity). These impacts are usually associated with the construction, operational or maintenance of an activity and are generally obvious and quantifiable.

### **Mitigate**

The implementation of practical measures to reduce adverse impact (DEA).

### **Environmental Management Plans**

This document that provides appropriate mitigation measures designed to minimize or eliminate the significant adverse impacts that may be caused as a result of the proposed project.

### **Interested and affected parties (I&APs)**

Individual, communities or groups, other than the proponent or the authorities, whose interests may be positively or negatively affected by proposal or activity and/or who are concerned with a proposal or activity and its consequences. These may include local communities, investors, business association, trade unions, customers, consumers and environmental interest group. The principle that environmental consultants and stakeholder



engagement practitioners should be independent and unbiased excludes these groups from being considered stakeholders (DEA, 1998).

## **ABBREVIATIONS**

<b>BAR</b>	– Basic Assessment Report
<b>BID</b>	– Background Information Document
<b>CBD</b>	– Central Business District
<b>CA</b>	– Competent Authority
<b>CEMP</b>	–Construction Environmental Management Plan
<b>CMP</b>	-Construction Management Plan
<b>CLO</b>	– Community Liaison Officer
<b>DEA</b>	– Department of Environmental Affairs
<b>DoH</b>	– Department of Health
<b>DWS</b>	– Department of Water Affairs and Sanitation
<b>EAP</b>	– Environmental Assessment Practitioner
<b>ECO</b>	– Environmental Control Officer
<b>EIA</b>	– Environmental Impact Assessment
<b>EIAR</b>	- Environmental Impact Assessment Report
<b>EIS</b>	– Ecological Importance and Sensitivity
<b>EMPr</b>	– Environmental Management Programme report
<b>GN</b>	– Government Notice
<b>I&amp;AP</b>	– Interested and Affected Party
<b>KM</b>	– Kilometres
<b>MAP</b>	– Mean Annual Precipitation
<b>MM</b>	– Millimetres
<b>NEMA</b>	– National Environmental Management Act, Act 107 of 1998 as amended
<b>NEMAQA</b>	– National Environmental Air Quality Act
<b>NEMWA</b>	– National Environmental Management Waste Act
<b>NWA</b>	– National Water Act
<b>PM</b>	– Project Manager
<b>PPP</b>	– Public Participation Process
<b>R</b>	– Regulation
<b>SASS</b>	– South African Scoring System
<b>SAHRA</b>	- South African Heritage Resources Agency

## **Declaration of Independence**

I **Takalani Mudau**, in my capacity as specialist consultant, hereby declare that i -

- Act as an independent consultant;
- Do not have any financial interest in the undertaking of the activity, other than remuneration for the work performed in terms of the National Environmental Management Act, 1998 (Act 107 of 1998);
- Undertake to disclose, to the competent authority, any material information that has or may have the potential to influence the decision of the competent authority or the objectivity of any report, plan or document required in terms of the National Environmental Management Act, 1998 (Act 107 of 1998);
- As a registered member of the South African Council for Natural Scientific Professions, will undertake our profession in accordance with the Code of Conduct of the Council, as well as any other societies to which we are members; and
- Based on information provided to us by the project proponent, and in addition to information obtained during the course of this study, have presented the results and conclusion within the associated document to the best of our professional judgement.

Signature: \_\_\_\_\_ Date: \_\_\_\_\_

## 1. INTRODUCTION

---

### 1.1 Background

South Africa has re-affirmed the importance of the national commitment to biodiversity. The National Environmental Management: Biodiversity Act, 2004 (Act 10 of 2004) has been assented by the President of South Africa and was published in the Government Gazette in June 2004 (Vol. 467; No 26426). The objective of this Act is to provide for, amongst other things: management and conservation of South Africa's biodiversity within the framework of National Environmental Management Act, 1998; the protection of species and ecosystems warrant national protection; and the sustainable use of indigenous biological resources.

Mang GeoEnviro Services have been appointed by Makhado local Municipality, to conduct the EIA for the proposed Tshikota township development on the remainder of the farm Naturelle Loksasie 277 LS in Tshikota Township Makhado local Municipality, Limpopo Province. As part of the EIA application process, Biodiversity specialist study must be conducted. Mveledzo Environmental and safety solutions was appointed by Mang GeoEnviro Services to conduct biodiversity impact studies for the proposed Project. This report contains the results of the biodiversity aspects of the environmental impact assessment. Although several potential impacts on the biodiversity are mentioned in this report, other specialists in their specialist's reports address specifics. This report therefore focuses on the fauna and flora of the study area.

The proposed activity requires an Environmental Impact Assessment (EIA) to be undertaken in compliance with the regulatory requirements of the National Environmental Management Act (Act 107 of 1998) (NEMA) and the Environmental Impact Assessment (EIA) Regulations, 2010, GN R.453, R.544 and R546.

As part of the EIA Process, it is required that specialist studies be conducted before the construction and operational phases.

Mveledzo Environmental and safety Solutions Pty Ltd was appointed by Mang Geo-Enviro Services, a representative of the applicant, to manage the biodiversity study that will form part of the environmental authorisation process for the proposed development.

This ecological report forms part of the specialist studies that were conducted prior to the commencement of the development. It is important to conduct Biodiversity assessment because in the past planning and development of urban and industrial areas did not include an assessment of the assets of the natural environment. In order to prevent the further destruction of any ecosystem, it is important that planning and co-ordination of human activities and development should include studies of the natural environment, involving soil, water, floral, faunal and cultural or historical aspects. This specialist studies and surveys were commissioned to:

- identify flora species
- identify vegetation communities
- identify fauna species (small mammals, reptiles, birds & large mammals) and potential habitats
- identify red data species (fauna & flora) and their habitats
- evaluate the sensitivity of each plant community & red data species habitat
- map vegetation communities & red data species / habitats, and
- identify medicinal, invasive and/or exotic plants that might occur

## 1.2 Project description

This township is located 6 km from Louis Trichardt in Tshikota Township in the Limpopo province. The proposed Township is proposed to be built on the remainder of the farm Naturelle Loksasie 277 LS in Tshikota Township Makhado local Municipality, Limpopo Province. The area is still within a natural state and has been partially impacted by human activities such as cutting down of trees for wood and illegal dumping. The site is bordered to the east by Tshikota Township.

### 1.3 Study Approach

The study was conducted in two ways which are site visits and desktop study for the proposed site.

#### 1.3.1 Site visits

The site visit was conducted on the 5 June 2021. The main aim of the site visit was to identify and record all the fauna and flora that are available on the proposed site. All the species that were found onsite were then recorded and identified. The method that was used to record the available species was to transect through all the areas where proposed township is to be situated. The significance of each “actual impact” was then determined and to determine the broad legal requirements of potential impacts and some broad mitigation measures, a broad legal overview has been conducted.

#### 1.3.2 Desktop study

Different sources were visited in order to get the biodiversity of the area and information that was collected from such sources were then verified by the site visit. Although we managed to get the information from different sources the site visit was more informative and giving the clear picture of the biodiversity on site.

### 1.4 Vegetation study

The aim for this study was to

- Carry out fieldwork to locate and describe the current state of vegetation on the study area, key focus on the impact footprint(s) for site, so that there is a baseline description/status quo against which impacts can be identified and measured.
- Determine the species present and localities within each vegetation types.
- Generate a vegetation map showing the site in relation to any Critical Biodiversity Areas and links to ecological corridors and support areas, vegetation sensitivity, disturbed, transformed and potential “no-go” areas.
- Determine whether the study area falls wholly or partially within the distribution range of species listed as Vulnerable, Endangered or Critically Endangered and Protected.
- Provide site photos that show the current state of the vegetation (i.e. natural, transformed, disturbed etc.) Identify and describe the conservation value and

conservation planning frameworks relevant to this site (Regional Planning) for represented vegetation units.

- A detailed list of species of special concern.
- An indication of the irreplaceability value of vegetation types present on site.
- Describe the areas where indigenous vegetation has been transformed.
- Determine alien species present; their distribution within the study area and recommended management actions.
- A description of different micro-habitats, and the species associated with those habitats.
- Note and record the position of unusually large specimens of trees.
- Describe the potential direct, indirect and cumulative negative and positive impacts of the proposed activity on vegetation species during the construction, operation and decommissioning phases of the project.
- Identification of issues and potential direct, indirect and cumulative biodiversity impacts, which are to be considered in combination with any additional relevant issues that may be raised through the public consultation process. These include:
  - The cumulative impact of clearing for the operation of the township on floral species of concern both on the farm and in the greater area.
  - Disclose any gaps in information or assumptions made.
  - Recommendations for mitigatory measures to minimise impacts identified.
  - An outline of additional management guidelines.
  - Provide monitoring requirements, mitigation measures and recommendations in a table format as input into the Environmental Management Plan (EMP), as well as generic rehabilitation and re-vegetation guidelines.

## 1.5 Study area

The project is located just on the outskirts of Louis Trichardt 4 km east of town, in the Limpopo Province. The site is contained within the Makhado Local Municipality. The project is located 5 km from Thohoyandou. The site falls within the Savannah biome and it is bordered to the west by the Existing Tshikota Township.

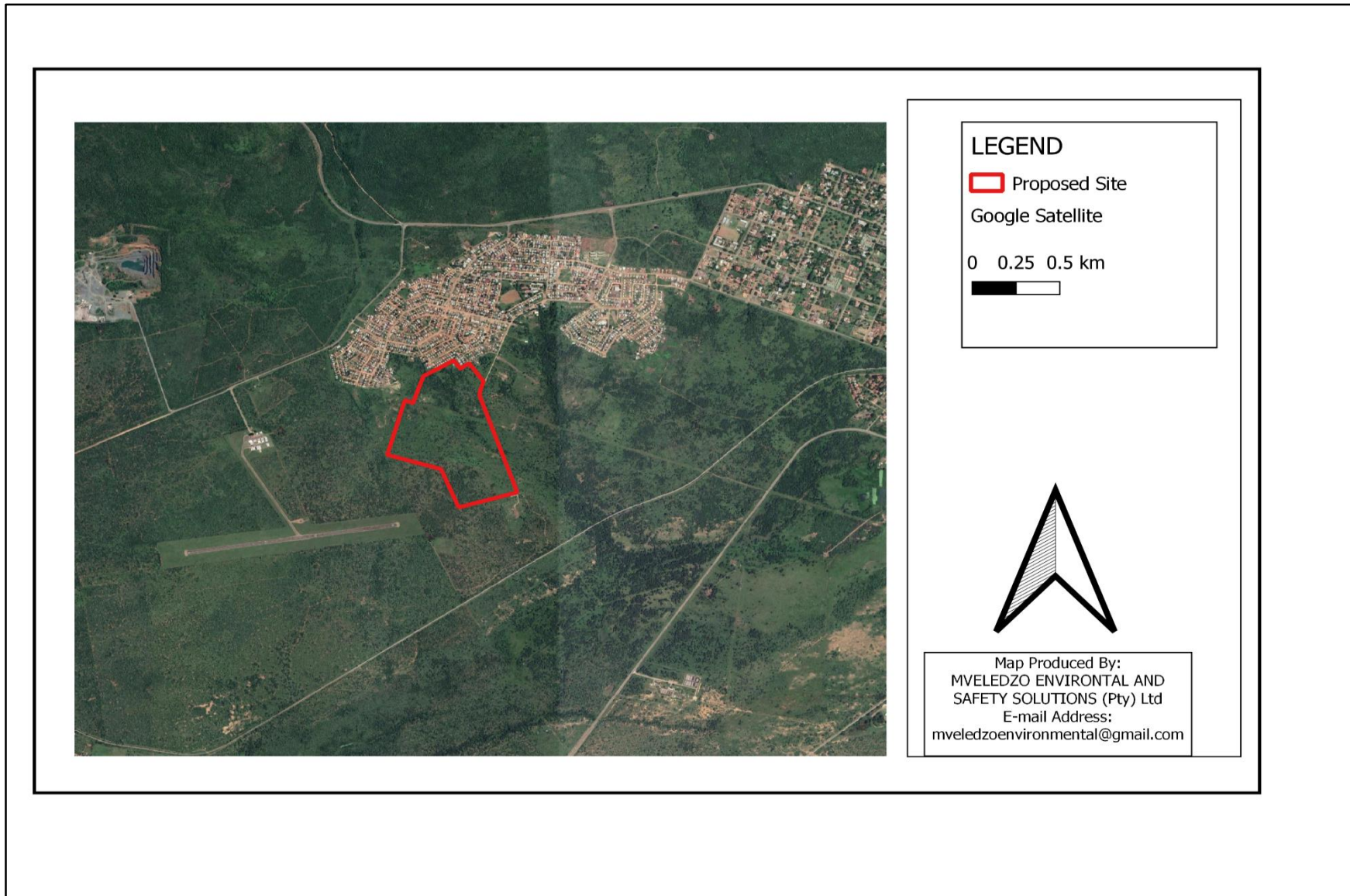


Figure 1: Locality map showing the site for the proposed township development,



## 1.6 Biodiversity of the Vhembe District Municipality (VDM) area

Groupings called Biomes (large-scale biotic communities) have been described for plants and/or animals living together with some degree of permanence, so that large-size patterns in global plant cover can be observed. Biomes broadly correspond with climatic regions, although other environmental controls are sometimes important. Each biome has a characteristic set of plant and animal species as well as a characteristic overall physiognomy (for example a general appearance given by the plant shapes). The general plant characteristics give a characteristic visual signature to the vegetation of the biome. Rutherford and Westfall (1994) map seven biomes of South Africa: Savanna, Thicket, Grassland, Forest, Fynbos, Nama Karoo, Succulent Karoo and Desert. The most recent treatise on the Biomes of South Africa was published in 2006 by Mucina and Rutherford).

The majority of the VDM landscape is characterized by undulating rolling hills with flat plains occurring in the east. The topography of the VDM is also characterized by the Soutpansberg, the northern most mountain range in South Africa. Its altitude ranges from 250 meters above mean sea level to 1748 meters at Lajuma, the highest peak. The Limpopo River System on the northern part of the district is considered to be the life blood of the Northern Vhembe semi-arid area. Limpopo River is the country's third most important river which provides sustenance to the predominantly hot and drylands. Vhembe area also boasts the widely known Lake Fundudzi which is steeped in cultural history. There is also the Mutale and Luvuvhu Catchments area with a number of tributaries emanating from the catchments. The Luvuvhu Catchment forms part of the larger Limpopo system, which extends into Mozambique. The Luvuvhu River and some of its tributaries (including the Mutshindudi and Mutale Rivers) rise in the Soutpansberg Mountains and flows for approximately 200 km before it joins the Limpopo River near Pafuri in the KNP. Other main rivers in the VDM are the Sand River, Luvuvhu River, Nzhelele River and the Shisha River.

The Savanna biome covers approximately 98% of the Vhembe District Municipality with the remainder being made up of Forest (1%) and Grassland (0.2%) biomes (CNdV Africa, 2015). Azonal vegetation is found in patches along the Limpopo, Luvuvhu and Shingwidzi Rivers. Vhembe District Municipality, inclusive of the KNP, has 24 different vegetation types. Two of

the 24 vegetation types are classified as Threatened ecosystems, namely Tzaneen Sour Lowveld which is classified as Endangered and the Lowveld Riverine Forest which is classified as Vulnerable in the national list of threatened ecosystems published in terms of the Biodiversity Act (DEA, 2011). It should also be noted that Mapungubwe Forest located on the northern border of the District near MNP is classified as Endangered. Thirteen (13) of the vegetation types occurring within the District are classified as endemic and five (5) as nearendemic. The Soutpansberg Centre of Endemism, the northern most mountain range in South Africa, stretches from east to west covering an area close to 130 Km. The Soutpansberg is truly diverse and home to approximately 2500- 3000 recorded vascular plant taxa, 594 tree taxa, 510 bird species, 116 reptile species and 145 mammal species (The Soutpansberg, 2003). This area also functions as an important biodiversity hotspot, ecological corridor, centre of endemism, Important Bird Area and Strategic Water Source Area. Additionally, the Soutpansberg Mountains houses one of the few natural inland lakes in South Africa, Lake Fundudzi. Several wetlands in this mountain range contain peat which harbours information going back 12 000 years. There is also the Makuleke Wetlands in the north east, an identified RAMSAR wetland, one of only two identified in Limpopo. The mountains also hold the catchments of several important Limpopo Province rivers, including the Sand, Mutamba, Nzhelele, Nwanedzi, Mutale and Luvuvhu. All of these flows north into the province's most important river, the Limpopo.

## 1.7 Climate

The Mean Annual Precipitation of Makhado is approximately 601 mm, and Mean Annual Temperature is 16.9 °C. The average rainfall (precipitation) and temperatures of Tshikota are shown below (Fig. 1).

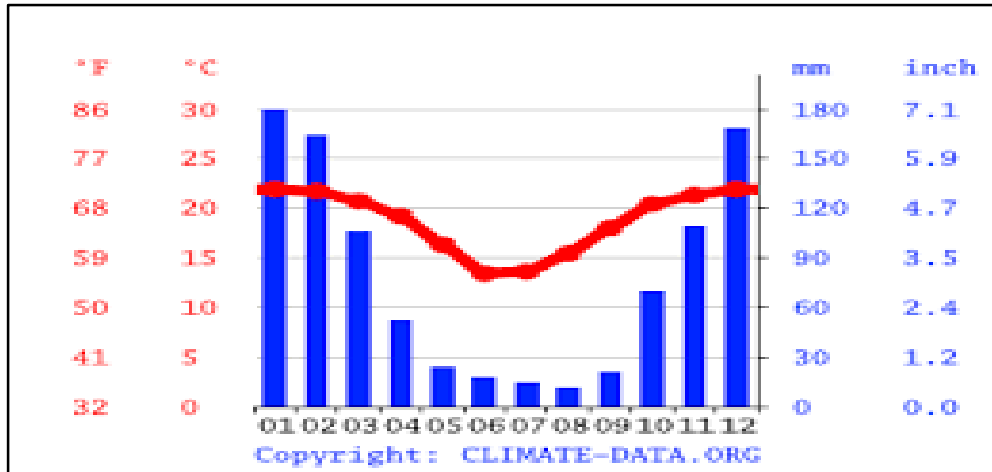


Figure 1: Climatic figures of Tshikota/makhado

According to Köppen -Geiger system (Kottek *et al.* 2006), the study area falls within the BSk (Local steppe) climatic region (Fig. 2).

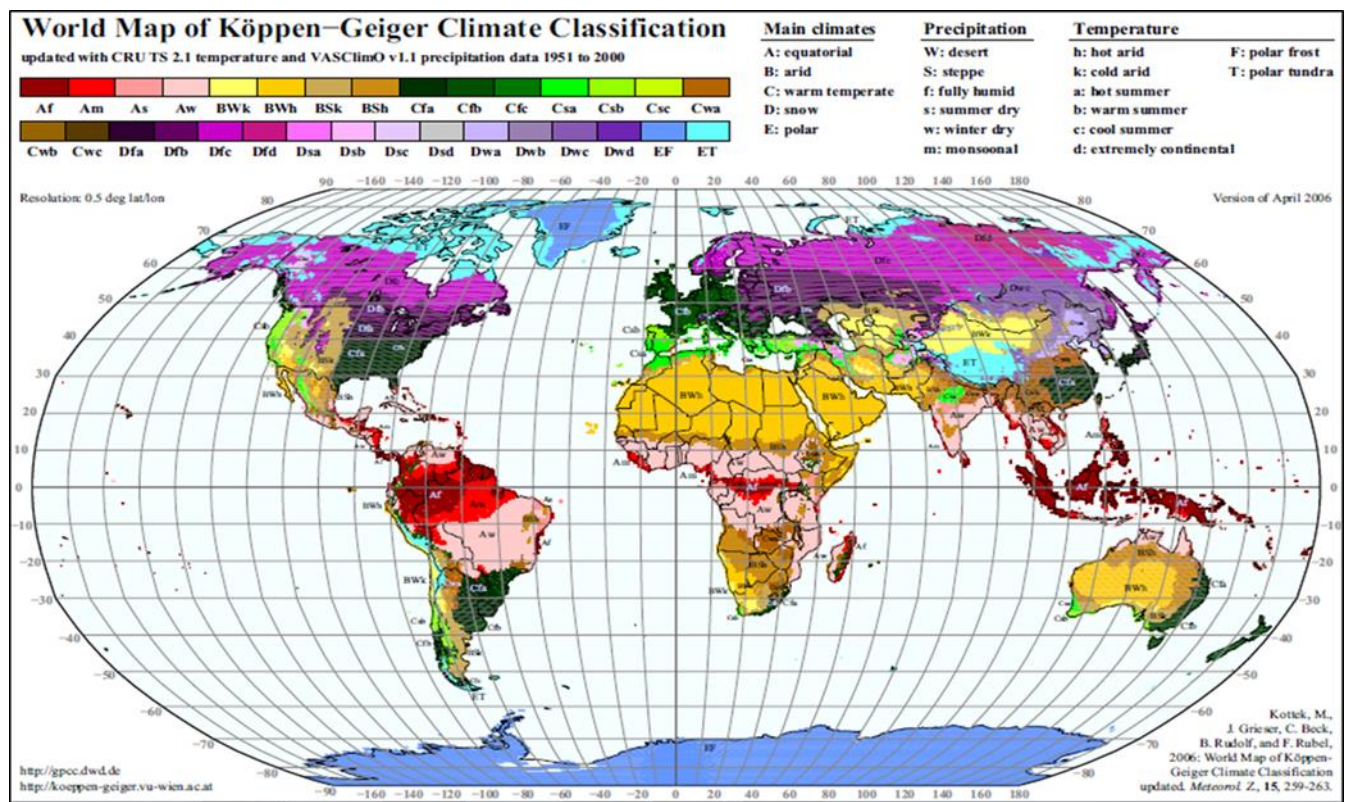


Figure 2: World map of Köppen -Geiger Climate Classification.

The project area falls within the Luvuvhu catchment area.

- Perennial rivers

Perennial rivers are those rivers, which have a constant flow throughout the year. It mainly consists of those rivers which flow throughout the year.

- Wetlands

A wetland is an area of marsh, peatland or water, whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish or salt, including areas of marine water the depth of which at low tide does not exceed ten metres. See sensitivity map for the type of wetlands found within the project area.

## 1.9 Geology

Geologically, the study area covers part of the junction between the granite-greenstone terrain of the north-eastern part of the Kaapvaal Craton and the highly metamorphic rocks of the Southern Marginal zone of the Limpopo Mobile Belt (Figure 4.5). Some authors (i.e. Roering et al. 1992) have suggested that the Limpopo Mobile Belt in the northern part of South Africa is the world's earliest example of a Himalayan-type continent-continent collisional orogeny between two large 65 cratons (Kaapvaal- and Zimbabwe Cratons). However, according to Kramers et al., (2006) no consensus regarding the geological process, setting or timing of the Limpopo Mobile Belt have been reached. The resulting Limpopo Mobile Belt consists of three main crustal zones, namely the Northern Marginal Zone, the Central Zone and the Southern Marginal Zone, which lie parallel to one another in an ENE direction. The geology of the study area is dominated by two lithostratigraphical units in the crystalline complex, namely the Goudplaats-Hout River Gneiss and Groot-Letaba Gneiss. These Palaeoarchean (3,600-3,200 million years) gneissic bodies range from homogenous to strongly layered, leucocratic felsic to mafic minerals. The previous subdivision of the strongly migmatized Hout River Gneiss and less well-migmatized Goudplaats Gneiss is no longer regarded as tenable. However, granitoid gneisses occurring between the Murchison (Gavelotte Group) and the Pietersburg-Giyani greenstone belts have been grouped together under the term Groot-Letaba Gneiss (Brandl and Kröner, 1993). These rocks are bounded in

the southeast by the Letaba Shear Zone. Archaean Greenstone Belts. The Rhenosterkoppies (Zandriverspoort Formation), Pietersburg (Pietersburg Group), (Giyanii Group) and northern part of the Murchison (Gravelotte Group) Greenstone Belts occur in the study area. They are composed largely of extrusive mafic and, to lesser extents, ultramafic and felsic rock. These Greenstone Belts are infolded mainly into grey granitic gneisses which dominate the early Archaean terranes. The NE-trending Pietersburg and Giyani Greenstone Belts extend parallel up to the southern part of the SMZ of the Limpopo Belt. The Murchison Greenstone Belts exists along a major ENE-WSW crustal lineament known as the “Thabazimbi-Murchison Lineament” (TML). Because of the orientation of the TML, the Greenstone Belts and the LMB, many of the geological structures recorded in the study area are parallel with this NE-SW trend. Neoproterozoic Intrusions A number of massive, unfoliated granite intrusions occur as batholiths, plutons and stocks in the study area. These granitic intrusions form prominent topographical features that can be seen north of Polokwane. The most distinct of these plutons are Matlala Granite, Moletsi Granite, Mashashane Suite (Granites) and Matok Granite. The Matok Granite was emplaced just north of the HRSZ. The Duivelskloof leucogranite and the Turfloop Granite, which forms elongated northeast-trending batholiths, are the most voluminous granite bodies in the study area. However, the contacts with the surrounding granitoid gneisses of these large batholiths are not well defined. Various other granite intrusives occur throughout the study area including the Schiel Complex located immediately north of the northeast-orientated Kudus River Lineament (Figure 4.6).

#### 1.10 Applicable environmental legislation

<b>LEGISLATION</b>	<b>SECTIONS</b>	<b>RELATES TO</b>
The Constitution (No 108 of 1996)	Chapter 2	Bill of rights
	Chapter 24	Environmental Rights

National Environmental Management Act (No 107 of 1998, as amended)	Section 2	Defines the strategic environmental management goals and objectives of the government. Applies through-out the republic and to the actions of all organs of state that may significantly affect the environment.
	Section 24	Provides for the prohibition, restriction and control of activities which are likely to have a detrimental effect on the environment.
	Section 28	The developer has a general duty to care for the environment and to institute such measures as may be needed to demonstrate such care.
National Environmental Management: Waste Act (No 59 of 2008)		Provides for specific waste management measures and the remediation of contaminated land.
Environmental Conservation Act (No 73 of 1989) and regulations.	Section 19 and 19A	Prevention of littering by employees and sub-contractors during construction and the maintenance phases of the proposed storage dam.
National Environmental Management: Air Quality Act (No 39 of 2004)	Section 34 and 35	Control of dust

### 1.11 Land use activities of the study area

The primary land use within the local area is a mixture of mainly residential, open space and livestock farming. Regardless of the human activities influence in the area, dense thicket dominates the area. It was clear from the site visit and the aerial imagery that the area is still of high biodiversity value since indigenous vegetation still occurs.

## 2. POTENTIAL ENVIRONMENTAL IMPACTS

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Potential impacts were evaluated against the results of the terrestrial fauna assessment. The relevant impacts were then subjected to a prescribed impact assessment methodology which is described below. Impacts were assessed in terms of the construction and operational phases. The operational phase refers to that phase of the project where the township development has been completed. Due to the nature of this development, the operational phase is assessed as lasting indefinitely and there is no closure or post- closure phases in this scenario. Mitigation measures were only applied to impacts deemed relevant based on the impact analysis. The likelihood and consequence descriptors are presented in Table 9 and Table 10. The significance rating matrix is presented in Table 11

### 2.1 Cultural biodiversity resources / products

Plants and animals form an integral part of the culture of communities and as such, biodiversity cannot be separated from cultural heritage. For example, Specific trees and bushes serve as grave markers and the positions are known to family members only. Biodiversity resources are used as traditional food sources (e.g. *mashonzha* worm), in traditional healing and spiritual rituals. Conserving cultural heritage therefore also includes conserving the sense of place, associated landscape and biodiversity. This impact should as such be integrated with the cultural and heritage impact study. The area has is still within its natural state< but it has been partially disturbed on the other part but it is already in the state of recovery. The original natural status of the area has been changed with some alien invasive plants establishing themselves in the area and therefore competing with native species for resources.

### 2.2 Habitat destruction and modification

The operation of the township and erection of infrastructure is likely to impact wildlife and birds via two primary mechanisms: 1) Large areas are often cleared for the township construction, resulting in significant destruction / modification of habitat, and 2) Increased human pressure associated with the township personnel may affect animals directly through them being killed when they enter the area, etc. as well as through activities such as poaching. Moreover, many components of the infrastructure associated with the township, such as powerlines and roads, which will alter normal movement routes. However, the impact will be very minimal in this operation since there will be having less infrastructure and less clearing of vegetation is advised especially with big plant species. The development is also occurring in the close proximity of well-developed area and there are no lot of the fauna species. Human activities can also result in the establishment of populations of invasive species, such as rats and plants used in artificial wetlands for treating effluent.

### 2.3 Water quality

Township brings people together to study in the same area, where there can be littering from general waste, vehicles leaks, hazardous waste do occurs that have the potential to adversely affect scarce water resources in the proposed development area if not properly managed. The type of wastewater emanating from the sewer blockages and hydrocarbons spillages depends largely on the chemical properties of the hydrocarbon materials that come into contact with the water. Chemical pollutants that accumulate in waterways adversely impact aquatic and riparian vegetation. Similar to the impacts of chemical air pollutants, chemical water pollutants can inhibit processes including photosynthesis, water regulation and respiration, which can reduce growth and development of plants. Water impacts that may results from township development activities:

- 1) Sediment run-off – rainfall can cause significant amounts of run-off especially if the soil is exposed (removed) of vegetation which in turn can results in soil erosions.
- 2) Leaching of pollutants from the hazardous waste – toxic substances present in hazardous waste not stored properly can be leached in groundwater during rainfall. In addition.



- 4) Sewage effluent – water used for domestic and sanitary purposes on site can pollute surface or ground water if not treated correctly which affects the growth of plants if water is contaminated.

## POTENTIAL IMPACTS

- Washing of general waste that may be littered around the township
- Spillages from vehicles may impact on the ground and surface water
- Hydrocarbon leaks from vehicles
- Sewer blockages can flow to the nearby streams

### 2.4 Air quality

The significant form of air pollution from the township development is particulate matter (PM) emissions. The diesel trucks, generators and cars may be a source of PM emissions. Impacts from particulate matter (PM) emissions may include low viability of annual species or reduced growth rates during periods when fugitive dust is particularly high. Fugitive dust has the potential to impair respiratory functions of wildlife; however, there are few published studies that address the short or long-term implications of dust pollution on wildlife health. During construction or site establishment, gasoline and diesel fuelled vehicles and equipment will generate gaseous and particulate exhaust emissions, including volatile organic compounds (VOCs), carbon monoxide (CO) and nitrogen oxides (NO<sub>x</sub>). During the road transportation of fuel, gaseous, particulate exhaust emissions and particulate matter (PM) emissions will also occur along the transport route. This might be fairly localized and limited to areas along the road, but could also, depending on wind speed and direction, impact on larger areas. Pending on the length of the route, the impact will be on a large area.

#### POTENTIAL IMPACTS:

Particulate matter (PM) emissions through:

- Air pollution from the particulate matters of the vehicles travelling to and from the township development.

Increased PM may reduce radiation interception by plant canopies and may reduce precipitation through a variety of physical effects. It can also change the nutrient balance in coastal waters and large river basins affecting the diversity of ecosystems and contributing to acid rain effects.

## 2.5 Noise

Numerous environmental factors determine the level of sound at a given point of reception. These factors include: distance from the source of sound to receptor; surrounding terrain; ambient sound level; time of day; wind direction; temperature gradient and relative humidity. There are three major categories of noise sources associated with township. They are:

- fixed equipment or process operations (generators, pumps, conveyors, electrical equipment);
- Mobile equipment or process operations and
- Transport movements of products, and trucks and cars coming to the township.
- People/residence during the operational phase

It is expected that the noise levels generated on site may exceed the current ambient levels, resulting in a negative impact on animals. Noise may also impact on local residents.

### POTENTIAL IMPACTS:

- Increase in ambient noise levels from:
- Fixed equipment or process operations,
- Mobile equipment,
- Transport movements of products, raw material or waste on site, and
- Transport of products off site,
- Residence during operational phase.

Wildlife may be more sensitive to human presence during significant periods of their annual cycles, including the breeding season, therefore this may lead to animals present in the area to migrate to other quite areas, birds included.

## 2.6 Impact Assessment Methodology

The methods and format of the impact tables used in this chapter are in accordance to the requirements of the 2014 Regulations.

- The **nature**, which shall include a description of what causes the effect, what will be affected and how it will be affected.
- The **probability (P) of occurrence**, which shall describe the likelihood of the impact actually occurring. Probability will be estimated on a scale of 1–5, where 1 is very improbable (probably will not happen), 2 is improbable (some possibility, but low likelihood), 3 is probable (distinct possibility), 4 is highly probable (most likely) and 5 is definite (impact will occur regardless of any prevention measures).
- The **duration (D)**, wherein it will be indicated whether:
  - \* the lifetime of the impact will be of a very short duration (0–1 years) – assigned a score of 1;
  - \* the lifetime of the impact will be of a short duration (2-5 years) - assigned a score of 2;
  - \* medium-term (5–15 years) – assigned a score of 3;
  - \* long term (> 15 years) - assigned a score of 4; or
  - \* permanent - assigned a score of 5;
- The **extent (E)**, wherein it will be indicated whether the impact will be local (limited to the immediate area or site of development) or regional, and a value between 1 and 5 will be assigned as appropriate (with 1 being low and 5 being high):
- The **magnitude (M)**, quantified on a scale from 0-10, where 0 is small and will have no effect on the environment, 2 is minor and will not result in an impact on processes, 4 is low and will cause a slight impact on processes, 6 is moderate and will result in processes continuing but in a modified way, 8 is high (processes are altered to the extent that they temporarily cease), and 10 is very high and results in complete destruction of patterns and permanent cessation of processes.

- the **significance (S)**, which shall be determined through a synthesis of the characteristics described above and can be assessed as low, medium or high;
  - the significance rating is calculated by the following formula:

$$S \text{ (significance)} = (D + E + M) \times (P)$$

- The **status**, which will be described as either positive, negative or neutral.
- The degree to which the impact can be reversed.
- The degree to which the impact may cause irreplaceable loss of resources.
- The *degree* to which the impact can be *mitigated*.

Impacts should be identified for the construction and operational phases of the proposed development. Proposed mitigation measures should be practical and feasible such that they can be realistically implemented by the applicant.

## 2.7 Impacts on the vegetation

**Table 1: Loss of indigenous vegetation due to clearing for construction of buildings, roads and other infrastructure, waste dumps etc.**

<b>Nature:</b> The area for the proposed development will be cleared of vegetation, however it is anticipated that only the area to be developed will be stripped off vegetation. This will result in the loss of indigenous species, and the fragmentation of plant communities. The removal of vegetation will also expose soil increasing the risk of erosion.				
	<b>Without mitigation</b>		<b>With mitigation</b>	
<b>CONSTRUCTION PHASE</b>				
<b>Probability</b>	Definite	2	Definite	1
<b>Duration</b>	Permanent	2	Permanent	1
<b>Extent</b>	Local	2	Local	1
<b>Magnitude</b>	Low	4	Low	3
<b>Significance</b>	<b>Low</b>	<b>40</b>	<b>Low</b>	<b>20</b>
<b>Status (positive or negative)</b>	Positive		Positive	
<b>OPERATIONAL PHASE</b>				
<b>Probability</b>	Definite	2	Highly probable	1
<b>Duration</b>	Permanent	2	Permanent	1
<b>Extent</b>	Local	2	Local	1
<b>Magnitude</b>	Low	4	Low	3

<b>Significance</b>	<b>Moderate</b>	<b>40</b>	<b>Low</b>	<b>30</b>
<b>Status (positive or negative)</b>	Positive		Positive	
<b>Reversibility</b>	Low		Low	
<b>Irreplaceable loss of resources?</b>	Low		Low	
<b>Can impacts be mitigated?</b>	To limited extent			
<b>Mitigation:</b>				
<ul style="list-style-type: none"> <li>• Limit all developments to the minimum area required, and leave as much as possible natural vegetation intact.</li> <li>• Conserve the areas that will not be developed, particularly the relatively large plant species that is present in the proposed development area</li> <li>• Control all waste dumping and avoid pollution of natural vegetation,</li> <li>• Avoid planting of exotic plant species, and where they have already encroached, they must be controlled as soon as possible by the land owner</li> </ul>				
<b>Cumulative impacts:</b> With the surrounding area not their original state and the magnitude of this project is big, the impact won't be moving to the neighbouring farms but will however be localised to the project area.				
<b>Residual Risks:</b> Not currently known.				

**Table 2. Loss of indigenous vegetation due to excavation, clearing for construction of buildings, roads and other infrastructure, waste dumps etc.**

<b>Nature:</b> Alien invasive plant species has already encroached into disturbed areas that was disturbed by the disturbances that had occurred on the proposed land. It is not expected that extensive area will be disturbed since the township infrastructure is to be only on a portions of the farm, natural vegetation will not be totally destroyed.				
	<b>Without mitigation</b>		<b>With mitigation</b>	
<b>CONSTRUCTION PHASE</b>				
<b>Probability</b>	Definite	2	Definite	1
<b>Duration</b>	Permanent	2	Permanent	1
<b>Extent</b>	Local	2	Local	1
<b>Magnitude</b>	Low	4	Low	1
<b>Significance</b>	<b>Low</b>	<b>30</b>	<b>Low</b>	<b>20</b>
<b>Status (positive or negative)</b>	Positive		Positive	
<b>OPERATIONAL PHASE</b>				
<b>Probability</b>	Definite	5	Definite	5
<b>Duration</b>	Permanent	5	Permanent	5
<b>Extent</b>	Local	5	Local	5
<b>Magnitude</b>	Low	10	Low	10
<b>Significance</b>	<b>Low</b>	<b>20</b>	<b>Low</b>	<b>10</b>
<b>Status (positive or negative)</b>	Positive		Positive	

<b>Reversibility</b>	Low	Low
<b>Irreplaceable loss of resources?</b>	Moderate	Moderate
<b>Can impacts be mitigated?</b>	Not regarded as feasible	
<b>Mitigation:</b>		
<ul style="list-style-type: none"> <li>• An alien invasive management programme must be incorporated into the Environmental Management Programme;</li> <li>• Ongoing alien plant control must be undertaken;</li> <li>• Areas which have been disturbed will be quickly colonised by invasive alien species. An ongoing management plan must be implemented for the clearing/eradication of alien species.</li> <li>• Monitor all sites disturbed by construction activities for colonisation by exotics or invasive plants and control these as they emerge.</li> <li>• Avoid planting of exotic plant species in public areas or home gardens, use indigenous species.</li> </ul>		
<b>Cumulative impacts: Low</b> , With the surrounding area not in their original state and the magnitude of this project is big, the impact won't be moving to the neighbouring farms but will however be localised to the project area.		
<b>Residual Risks:</b> Not currently known		

### 3. RESULTS AND DISCUSSION

#### 3.1 Site biodiversity

South Africa is considered one of the most biologically diverse country in the world due to its species diversity and endemism as well as its diversity of ecosystems. South Africa occupies only 2% of the world's land surface area yet is home to 10% of the world's plant species and 7% of the reptile, bird and mammal species. Sixty-five percent of its 23 000 plant species are endemic to South Africa. In terms of the number of endemic species of mammals, birds, reptiles and amphibians, South Africa ranks as the fifth richest country in Africa and the 24th in the world. The terrestrial biodiversity of South Africa can be divided into nine biomes. National Red List assessments of the status of South Africa's species indicate that 10% of South Africa's birds and frogs, 20% of its mammals and 13% of its plants are threatened. South Africa's biodiversity is facing threats on several fronts, including habitat loss and degradation, invasive alien species, flow modification, overharvesting, pollution and climate change. Many areas of natural habitat are replaced, often irreversibly, by alternative land uses such as urban development, industrial and mining development, agricultural activities such as clearing land for cultivation of crops, or forestry plantations. An emerging threat that could result in substantial further loss of natural habitat (and additional pressure on freshwater resources)

is crops for biofuel production. Aquatic habitats can be completely transformed by canalisation and marine habitats can be destroyed by trawling and other types of development.

The savannah biome is fairly homogenous and the proposed site is the only area remaining with vegetation in the surrounding area. It was assumed from the site visit and the google earth map that the majority of the site is recovering from an event of disturbance, since the majority of plant species are juveniles. On the site, the croplands are flourishing very well and it is dominated by the indigenous plant species with the exception of very few exotic plant species. The balance of the site was considered to be on their original state and is maintaining the indigenous plant species of conservation concern, however it may still provide valuable foraging area for some bird species but many of these species will be generalist species. There was evidence of presents of birds since there some birds' nests that were sported during the site survey.

There was no mammal species that was found and identified on site but animals that used to occur on the area before has been tabulated below on table 3. All the species that was identified on site was then checked on the SANBI red list and they were found to be endemic and none endemic to South Africa and they were all of least concern and only of them was listed as either protected or endangered and they have been listed in different tables below. Although birds' nest where noticed on site there was presence of different birds' spices noted in the vicinity of site and they have been tabulated below. Therefore, this area can be also identified as an area of medium conservation value with only protected species identified namely *schlerocharia birrea* and there is a no biodiversity sensitive environment in a close proximity of site see the biodiversity map below which shows the area that is to be developed.

Below is the list of the indigenous plant species (grasses included) that were identified onsite

Scientific name	Family	Status
<i>Themeda triandra</i>	Poaceae	LC
<i>Vachellia tortilis</i>	Fabaceae	LC
<i>Vachellia karroo</i>	Fabaceae	LC
<i>Senegalia nigrescens</i>	Fabaceae	LC
<i>Senegalia mellifera</i>	Fabaceae	LC
<i>Dichrostachys cinerea</i>	Fabaceae	LC

<i>Terminalia sericea</i>	Combretaceae	LC
<i>Dombeya rotundifolia</i>	Sterculiaceae	LC
<i>Combretum molle</i>	Combretaceae	LC
<i>Peltophorum africanum Sond</i>	Fabaceae	LC
<i>Senegalia burkei</i> (Benth.)	Fabaceae	LC
<i>Burkea africana</i>	Fabaceae	LC
<i>Albizia adianthifolia</i>	Fabaceae	LC
<i>Grewia monticola</i>	Malvaceae	LC
<i>grewia flavescens</i>	Malvaceae	LC
<i>Ficus sycomorus</i>	Moraceae	LC
<i>Ziziphus rivularis</i>	Rhamnaceae	LC
<i>Ziziphus mucronata</i>	Rhamnaceae	LC

Table 1: The list of the indigenous plant species

The list of Alien invasive plant species on site are listed below

Scientific name	Family
<i>Solanum mauritianum</i>	Solanaceae
<i>Datura stramonium</i>	Solanaceae
<i>Bidens pilosa</i>	Asteraceae
<i>Solanum incanum</i>	Solanaceae

Table 2: The list of Alien invasive plant species on site

The list of indigenous animals that use to occur onsite are tabulated below

Scientific name	Family	Status
<i>Tragelaphus strepsiceros</i>	Bovidae	LC
<i>Aepyceros melampus</i>	Bovidae	LC
<i>Tragelaphus sylvaticus</i>	Bovidae	LC
<i>Syncerus caffer</i>	Bovidae	LC
<i>Connochaetes taurinus.</i>	Bovidae	LC
<i>Chlorocebus pygerythrus</i>	Cercopithecidae	LC

Table 3: The list of indigenous animals

List of birds that were found on site are listed below.

Scientific name	Family	Status
<i>Corvus albus</i>	Corvidae	LC
<i>Vidua paradisaea</i>	Viduidae	LC
<i>Uraeginthus angolensis</i>	Estrildidae	LC
<i>Pternistis swainsonii</i>	Phasianidae	LC
<i>Streptopelia capicola</i>	Columbidae	LC



<i>Numida meleagris</i>	Numididae	LC
<i>Strix nebulosa</i>	Strigidae	LC
<i>Ploceus cucullatus</i>	Ploceidae	LC

Table 4: List of birds that were found on site

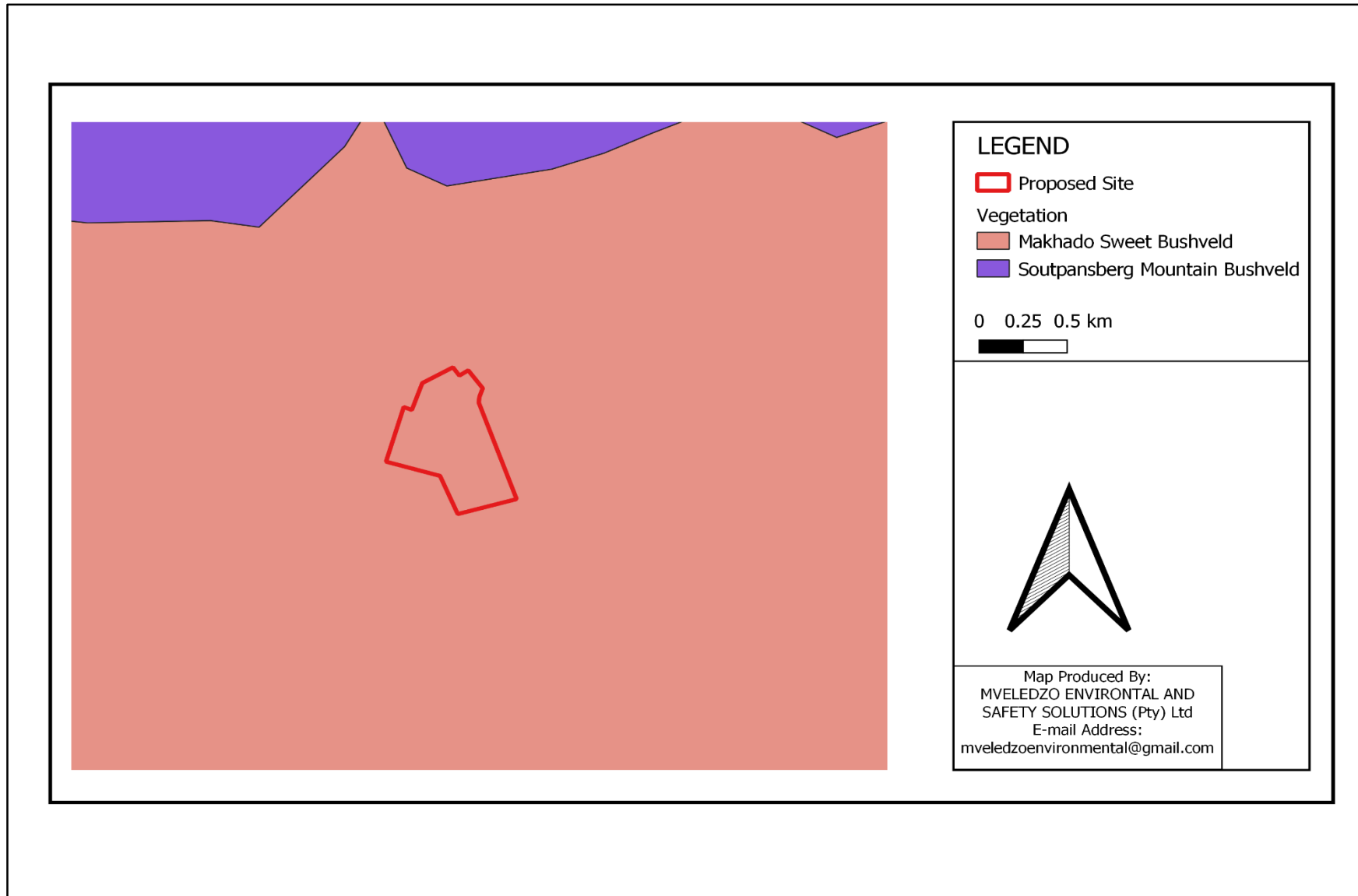


Figure 5: map showing the Biodiversity sensitivity of the area



Photo 1: Shows the plant species on the proposed site



Photo 2: Shows illegal dumping at the proposed site.



Photo 3: Shows Some Acacia sp onsite



Photo 4: Shows the stretch of indigenous vegetation stretched onsite.



Photo 5: Shows the evidence of cutting down of tree for wood purposes



Photo 6: Shows southern part of the site plant species onsite

#### 4. CONCLUSION AND RECOMENDATIONS:

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From an ecological perspective, the site is a favorable location for the township activity. There is sufficient space available at the site to accommodate the development and there are no any sensitive environmental and there were no species which falls within the protected plant category which were noted on site. The area still maintains the indigenous environment though the wood harvesting and illegal dumping were evident. Vegetation clearing must always be kept at minimal. If recommendation made on the EMPr are adhered to then there will be minimal damage to the existing grassland and all associated species close to the proposed township.

It is the responsibility of the applicant that it must rehabilitate and increase the conservation value of the area after the construction of the township. Any risk and impact assessment is but an exercise based on facts, assumptions and perceptions, and can by no means give an exact reflection of all possible scenarios. The success of proposed, and still to be developed, mitigation measures will largely depend on the commitment of the developer to its social and environmental responsibility, management of the impacts and mitigation measures and allocation of financial resources to implement such mitigation measures

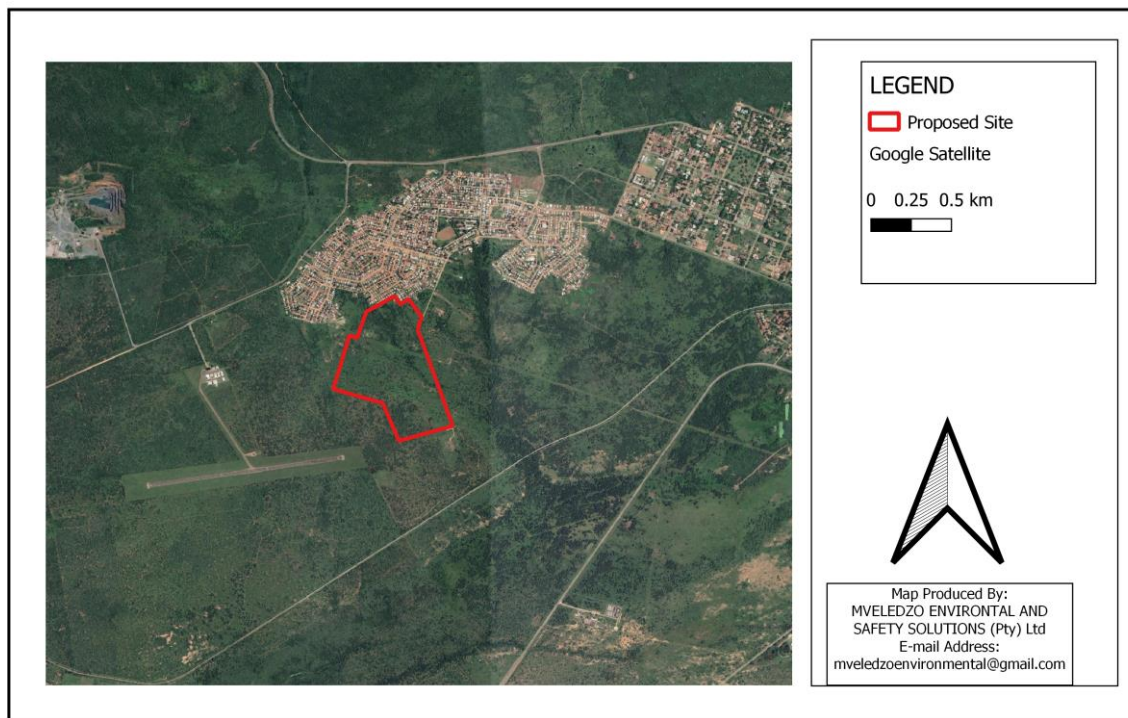
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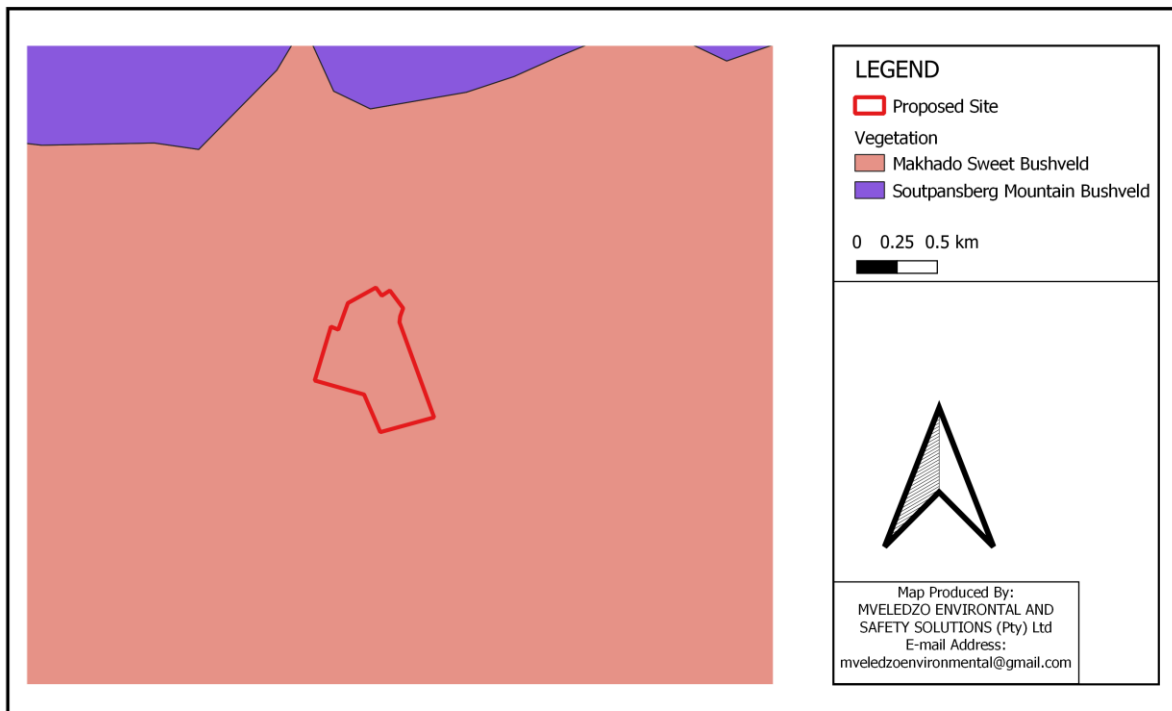
## 6. APPENDIX

### Appendix A





## Appendix B



DE



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**PHASE 1 HERITAGE IMPACT ASSESSMENT REPORT  
FOR THE PROPOSED TOWNSHIP ESTABLISHMENT OF 300 SITES ON  
REMAINDER OF PORTION 1 OF THE FARM NATURALLE LOKSASIEW 272 LS  
WITHIN MAKHADO LOCAL MUNICIPALITY OF VHEMBE DISTRICT, LIMPOPO  
PROVINCE.**

*Compiled for:*

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**May 2021**

## **Executive Summary**

**Local Authority:** Makhado Local Municipality

**Magisterial Authority:** Vhembe District Municipality

**Type of Development:** Township Establishment

**Status of the Report:** Final Report

**Date of field work:** May 2021

**Date of report:** May 2021

### **Purpose of the Study**

Vhufa Hashu Heritage Consultants was appointed by Ngoti Development Consultants to undertake a phase 1 Heritage Impact Assessment of a proposed Township Establishment of 300 sites on remainder of portion 1 of the farm Naturalle Loksasiew 272 LS near Tshikota area under Makhado Local Municipality of Vhembe District, Limpopo Province, in compliance with Section 38 of the National Heritage Resources Act 25 of 1999.

The purpose of this study is to identify heritage resources within a proposed development area, assess their significance, the impact of the development on the heritage resources and to provide relevant mitigation measures to alleviate impacts to the heritage resources. An assessment of impacts on heritage resources defined in section 3 of the NHRA, heritage assessment is required in terms of section 38 of the NHRA.

South Africa's historical, archaeological and paleontological heritage resources are unique and non-renewable as defined in section 3 of the NHRA. Heritage Resources as defined in section 3 of the NHRA are given "formal" protection in terms of section 27-29 and 31-32 of the NHRA and "general" protection in terms of sections 33,34,35,36 and 37 of the NHRA. Therefore, no damage, destruction or alteration may occur to heritage resources without a permit issued by a relevant heritage authority.

An assessment of impacts on heritage resources of a development is required in terms of section 38(1 and 8) of the NHRA. Where possible, heritage resources should be preserved *in situ* and conserved for future generations. This can be achieved through a monitoring and management plan that may be stipulated in the conditions issued on a development by an authority as per section 38(4)c of the NHRA. Where it is not possible to retain the

heritage resources *in situ*, and the heritage resources are not deemed significant, the loss of information can be reduced by recording and mitigation of the heritage resources through a process of excavation (or sampling) as a condition on the development in terms of section 38(4)d and e, after obtaining a permit from the relevant Heritage Resources Authority (HRA), at the cost of the developer. This allows us to record a part of the history of the place as part of the national inventory. Assessment and mitigation in the early phase of the development may save the developer considerable delays and related costs.

### **Heritage Resources Descriptions and Significance**

No heritage/archaeological resources was identified within the proposed Township Establishment site

### **Conclusion**

No further studies / Mitigations are recommended given the fact that within the proposed Township Establishment site and its surrounding there are no archaeological or place of historical significance to be impacted by the Township Establishment Development. From a Heritage perspective, the development should be allowed to continue.

**Acknowledgements:**

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**HERITAGE CONSULTANT:** Vhufashu Heritage Consultants

**CLIENT CONTACT PERSON:** Richard R Munyai

A handwritten signature in black ink, appearing to read 'R. R. Munyai'.

.....  
Archaeologist and Heritage Consultant

## **EXPLANATION OF ABBREVIATIONS USED IN THIS DOCUMENT**

<b>AIA</b>	Archaeological Impact Assessment
<b>ASAPA</b>	South African Archaeological Professional Association
<b>CMP</b>	Conservation Management Plan
<b>EIA</b>	Early Iron Age
<b>EMP</b>	Environmental Management Plan
<b>ESA</b>	Early Stone Age
<b>GPS</b>	Geographical Positioning System
<b>HIA</b>	Heritage Impact Assessment
<b>HMP</b>	Heritage Management Plan
<b>ICOMOS</b>	International Council of Monuments and sites
<b>LIA</b>	Late Iron Age
<b>LSA</b>	Late Stone Age
<b>MIA</b>	Middle Iron Age
<b>MSA</b>	Middle Stone Age
<b>NASA</b>	National Archives of South Africa
<b>NHRA</b>	National Heritage Resources Agency
<b>PRHA</b>	Provincial Heritage Resources Authority
<b>SAHRA</b>	South African Heritage Resources Agency
<b>SAHRIS</b>	South African Heritage Resources Information System
<b>VHHC</b>	Vhufa Hashu Heritage Consultants

## DEFINITIONS

**“Aesthetic value”** Important in exhibiting particular aesthetic characteristics valued by a community or cultural group.

**„Alter”** any action affecting the structure, appearance or physical properties of a place or object, whether by a way of structural or other works, by painting plastering or other decoration or any other means;

**“Conservation”** in relation to heritage resources, includes protection maintenance, preservation and sustainable use of places or objects so as to safeguard their cultural significance

**“Conservation Management Plan”** A policy aimed at the management of a heritage resource and that is approved by the Heritage Resources Authority setting out the manner in which the conservation of a site, place or object will be achieved

**“Cultural Significance”** As defined in the NHRA means aesthetic, architectural, historical, scientific, social, spiritual, linguistic or technological value or significance

**“Development”** means any physical intervention, excavation, or action, other than those caused by natural forces, which may in the opinion of a heritage authority in any way result in a change to the nature, appearance or physical nature of a place, or influence its stability and future wellbeing, including-

- (a) construction, alteration, demolition, removal or change of use of a place or a structure at a place;
- (b) carrying out any works on or over or under a place;
- (c) subdivision or consolidation of land comprising a place, including the structures or airspace of a place;
- (d) construction or putting up for display signs or hoardings;
- (e) any change to the natural or existing condition or topography of land; and
- (f) any removal or destruction of trees, or removal of vegetation or topsoil.

**“Heritage agreement”** means an agreement referred to in section 42,

**“Heritage Impact Assessment”** A report compiled in response to a proposed development that must meet the minimum requirements set out in the NHRA and should be submitted to a heritage resources authority for consideration.

**“Heritage site”** means a place declared to be a national heritage site by SAHRA or site declared to be a provincial Heritage site by a PHRA

**“Historic value”** Important in the community or pattern of history or has an association with the life or work of a person, group or organization of importance in history.

**“Improvement”** in relation to heritage resources includes repair, restoration and rehabilitation of a place protected in terms of this Act.

**“Interested and Affected Parties”** Individuals, organisations or communities that will either be affected and/or have an interest in a development or the resulting impacts of a development.

**“Management”** in relation to heritage resources includes the conservation, presentation and improvement of a place protected in terms of this Act.

**“Scientific value”** Potential to yield information that will contribute to an understanding of natural or cultural history or is important in demonstrating a high degree of creative or technical achievement of a particular period.

**“Social value”** Have a strong or special association with a particular community or cultural group for social, cultural or spiritual reasons.

**“Rarity”** Does it possess uncommon, rare or endangered aspects of natural or cultural heritage.

**“Representivity”** Important in demonstrating the principal characteristics of a particular class of natural or cultural places or object or a range of landscapes or environments characteristic of its class or of human activities (including way of life, philosophy, custom, process, land-use, function, design or technique) in the environment of the nation, province region or locality.



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## **1. INTRODUCTION**

Vhufa Hashu Heritage Consultants was appointed by Ngoti Development Consultants to undertake a phase 1 Heritage Impact Assessment of a proposed Township Establishment of 300 sites in Tshikota township under Makhado Local Municipality of Vhembe District, Limpopo Province.

The National Heritage Resources Act (NHRA - Act No. 25 of 1999) protects all structures and features older than 60 years (section 34), archaeological sites and material (section 35) graves and burial sites (section 36). In order to comply with the legislations, the Applicant requires information on the heritage resources, and their significance that occur in the demarcated area. This will enable the Applicant to take pro-active measures to limit the adverse effects that the development could have on such heritage resources.

## **2. TERMS OF REFERENCE**

The terms of reference for the study were to conduct heritage impact assessment for the proposed Township Establishment in Tshikota.

- ❖ the identification and mapping of all heritage resources in the area affected;
- ❖ an assessment of the significance of such resources in terms of heritage assessment criteria set out in regulations;
- ❖ an assessment of the impact of the development on heritage resources;
- ❖ an evaluation of the impact of the development on heritage resources relative to the interested parties regarding the impact of the development on heritage resources;
- ❖ if heritage resources will be adversely affected by the proposed development, the consideration of alternatives; and
- ❖ plans for mitigation of any adverse effects during and after completion of the proposed development.

### 3. DESCRIPTION OF THE AFFECTED AREA

The proposed Township Establishment is situated on the Southern side of Tshikota Township and North of Tshikota Grave Yard, west of the street to the grave yard. The area to be developed is generally situated south of Tshikota Township, road R522 from Makhado (formerly known as Louis Trichardt) to Vivo and north of the N1 (GPS S23°03'22.82" E29°52'23.04") within Makhado Local Municipality of Vhembe District, Limpopo Province.

The vegetation of the area and landscape features varies from low mountains, slightly to extremely irregular plains to hills. The geology and Soils is Soutpansberg Group of sandstones with lesser amounts of conglomerate, shale and basalt is mostly exposed in this area. Some Karoo Supergroup rocks are also present. Most of the area has deep sands to shallow sandy lithosols. A few limited areas with heavier soil, particularly in the B-horizon, occur near the western boundary of the Kruger National Park.



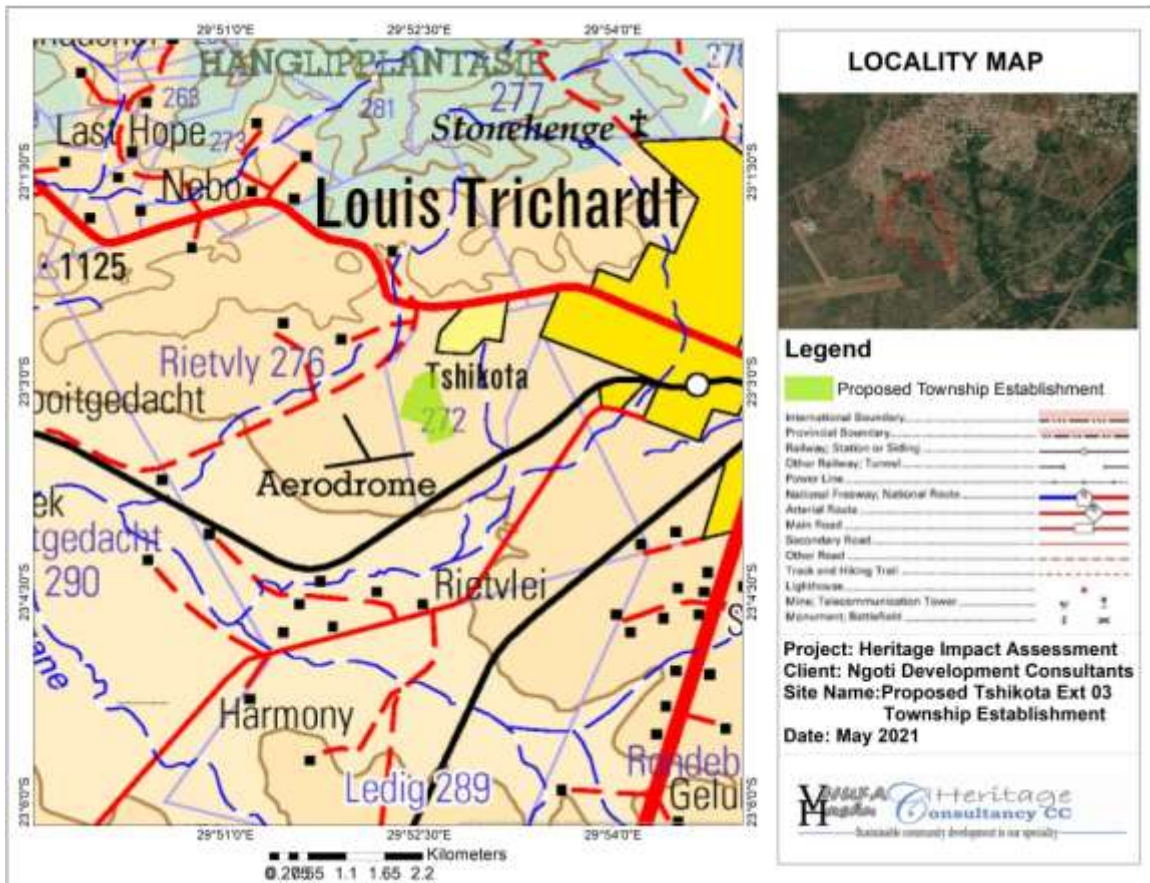
**Figure 1:** Aerial View of the proposed site.



**Figure 2:** Old aerial photo map



**Figure 3:** View of the field work track record.



**Figure 4:** Locality map



**Figure 5:** General view of the proposed site.



**Figure 6:** View of Tshikota Township where the new development will start.



**Figure 7:** Road to the grave yard taken from the grave yard gate and the Proposed site to the left.



**Figure 8:** Access road to the Masowe Church (note the white cloth).



**Figure 9:** Road within the proposed site which end at the Masowe Church.



**Figure 10:** View of Tshikota grave yard gate.

#### **4. LEGISLATIVE REQUIREMENTS**

Two sets of legislation are relevant for the study with regards to the protection of heritage resources and graves. These are the National Heritage Resources Act (Act 25 of 1999) and the National Environmental Management Act (Act 107 of 1998).

##### **4.1. The National Heritage Resources Act**

According to the above-mentioned act the following is protected as cultural heritage resources:

- Archaeological artifacts, structures and sites older than 100 years
- Ethnographic art objects (e.g. Prehistoric rock art) and ethnography
- Objects of decorative and visual arts
- Military objects, structures and sites older than 75 years
- Historical objects, structures and sites older than 60 years
- Proclaimed heritage sites
- Grave yards and graves older than 60 years
- Meteorites and fossils
- Objects, structures and sites of scientific or technological value.



The National Estate includes the following:

- Places, buildings, structures and equipment of cultural significance
- Places to which oral traditions are attached or which are associated with living heritage
- Historical settlements and townscapes
- Landscapes and features of cultural significance
- Geological sites of scientific or cultural importance
- Sites of Archaeological and palaeological importance
- Graves and burial grounds
- Sites of significance relating to the history of slavery
- Movable objects (e.g. Archaeological, paleontological, meteorites, geological specimens, military, ethnographic, books etc.)
- 

Heritage Impact Assessment (HIA) is the process to be followed in order to determine whether any heritage resources are located within the area to be developed as well as the possible impact of the proposed development thereon. An Archaeological Impact Assessment (AIA) only looks at archaeological resources. An HIA must be done under the following circumstances:

- The construction of a linear development (road, wall, power line, canal etc.) exceeding 300m in length
- A construction of a bridge or similar structure exceeding 50m in length
- Any development or other activity that will change the character of a site and exceed 5 000m<sup>2</sup> or involve three or more existing erven or subdivisions thereof
- Re-zoning of a site exceeding 10 000 m<sup>2</sup>
- Any other category provided for in the regulations of SAHRA or a provincial heritage authority.

#### **4.2. The National Heritage Resource Act (25 of 1999)**

This act established the South African Heritage Resource Agency (SAHRA) and makes provision for the establishment of Provincial Heritage Resources Authorities (PHRA). The Act makes provision for the undertaking of heritage resources impact assessments for various categories of development as determined by Section 38. It also provides for the grading of heritage resources and the implementation of a three tier level of responsibilities and functions for heritage resources to be undertaken by the State, Provincial authorities and Local authorities, depending on the grade of the Heritage resources. The Act defines cultural significance, archaeological and palaeontological sites and material (Section 35), historical sites and structures (Section 34), graves and burial sites (Section 36) which falls under its jurisdiction. Archaeological sites and material are generally those resources older than a hundred years, while structures and cultural landscapes older than 60 years, including gravestones, are also protected by Section 34. Procedures for managing grave and burial grounds are clearly set out in Section 36 of the NHRA. Graves older than 100 years are legislated as archaeological sites and must be dealt with accordingly.

Section 38 of the NHRA makes provision for developers to apply for a permit before any heritage resource may be damaged or destroyed.

#### **4.3. The human tissues act (65 OF 1983)**

This Act protects graves younger than 60 years. These fall under the jurisdiction of the National Department of Health and the Provincial Health Departments. Approval for the exhumation and re-burial must be obtained from the relevant Provincial MEC as well as the relevant Heritage Authorities.

Graves 60 years or older fall under the jurisdiction of the National Heritage Resources Act as well as the Human Tissues Act, 1983.

## **5. METHODOLOGY**

### **5.1. Source of information**

#### 5.1.1. Survey of Literature

The methodological approach used for the study is aimed at meeting the requirements of the relevant heritage legislation. As such a desktop study was undertaken followed by a survey of the impact areas. Most of the information was obtained through the site visit made on the 13 February 2020. In practice, most archaeological and historical sites are found through systematic survey of the target landscapes. The survey therefore, sought to identify cultural heritage sites including graves, burial grounds and contemporary religious or sacred ceremonial sites associated with the proposed Township Establishment. VHC heritage specialists conducted the reconnaissance survey and impact assessment by transecting the affected landscape on foot looking for indicators of archaeological and any other cultural materials in the affected areas. In part the field officer also inspected soil profiles for potential archaeological materials that may still be trapped *in situ* in an area disturbed by human activities as well the burrowing animals.

#### 5.1.2. Field Survey

Standard archaeological observation practices were followed; Visual inspection was supplemented by relevant written sources, and oral communications with local communities from the surrounding area. In addition, the site was recorded by hand held GPS Garmin Oregon 65 and plotted on 1:50 000 topographical map. Archaeological/historical material and the general condition of the terrain were photographed with a Garmin Oregon 65 Camera.

The field assessment section of the study was conducted according to generally accepted HIA practices and aimed at locating all possible objects, sites and features of archaeological significance in the area of the proposed development.

### 5.1.3. Documentation

All sites, objects and features identified were documented according to the general minimum standards accepted by the archaeological profession. Co-ordinates of individual localities are determined by means of the Global Positioning System (GPS). The information is added to the description in order to facilitate the identification of each locality.

## **6. RESULTS OF THE FIELDWORK**

No cultural heritage (archaeological or historical) sites, features or objects were found. There is no structures/buildings on site which are older than 60 years.

## **7. ARCHIVAL AND DESKTOP RESEARCH FINDINGS**

The historical data and cartographic resources represents a critical additional tool for locating and identifying heritage resources and in determining the historical and cultural context of the study area. The internet literature search was conducted and relevant archaeological and historical texts were also consulted. Relevant topographic maps old and new satellite imagery were studied.

Researching the SAHRIS online database (<http://www.sahra.org.za/sahris>), it was determined that very few archaeological studies had been performed in the vicinity of study area. Previous studies listed for the area in the Report Mapping Project included a number of surveys within the wider vicinity which are listed below:

Roodt, H. 1999. Phase 1 Archaeological Impact Assessment Vodacom Mast McKenzie, Giyani Northern Province. An unpublished report by R & R Cultural Resource Consultants on file at SAHRA as 1999-SAHRA-0069.

Van Schalkwyk, J.A. 2001a. Archaeological Investigation of Iron Smelting Site Mut 41, in the Nandoni Dam, Thohoyandou District, Northern Province. An unpublished

report by the National Cultural History Museum on file at SAHRA as 2001-SAHRA-0006.

Van Schalkwyk, J.A. 2001b. A Survey of Cultural Resources in Three Areas of Nandoni Dam, Thohoyandou, Northern Province. An unpublished report by the National Cultural History Museum on file at SAHRA as 2001-SAHRA-0040.

Murimbika, M. 2006. Archaeological Impact Assessment Study for the Proposed Construction of Electricity Distribution Powerlines Within, Limpopo Province. An unpublished report by Nzumbululo Heritage Solutions on file at SAHRA as 2006-SAHRA-0443.

Gaigher, S. & Hutten, M. 2007. Heritage Impact Assessment for the Proposed Malamulele Shopping Complex and High School, Malamulele Area, Limpopo Province. An unpublished report by Archaeo-Info on file at SAHRA as 2007-SAHRA-0351.

Munyai, R. & Roodt, F. 2008. Phase 1 Heritage Impact Assessment and Archaeological Investigation of a Proposed Magona Filling Station Within Vhembe District Municipality, Limpopo Province. An unpublished report by Vhufa Hashu Heritage Consultants on file at SAHRA as 2008-SAHRA-0490.

Murimbika, M. 2008. Phase 1 Cultural and Archaeological Heritage Impact Assessment Specialist Study for the Proposed Township Establishment at Malamulele in the Thulamela Local Municipality of Vhembe District, Limpopo Province. An unpublished report by Nzumbululo Heritage Solutions on file at SAHRA as 2008-SAHRA-0501.

Researching the SAHRIS online database (<http://www.sahra.org.za/sahris>) further studies were identified in the wider vicinity of the study area:

SAHRIS case number 605. Draft Basic Assessment Report for the Construction of a 35km 132 KV Powerline from Mbahe Substation to Mhinga Substation in Thohoyandou, within the Thulamela Local Municipality of the Limpopo Province, South Africa.

## **8. ARCHAEOLOGICAL BACKGROUND AND HERITAGE.**

The northernmost of South Africa is a well-known region; it appears on early historical documents as wildlife hunting grounds (Carruthers, 2003; Boeyens, 1985) trade network routes intersections (De Vaal, 1984) and lastly occurrence of early and late farming communities' archaeological sites (De Vaal, 1943; 1943; Prinsloo, 1974; Loubser, 1988). The presence of these sites has attracted attention of archaeologists since the early 1930s (Fouche, 1937; Hanisch, 1980; Mason, 1986). Archaeological investigations and assigning cultural identity to southern African farming communities goes back to the early 1931 following the work by Gertrude Caton Thompson at Great Zimbabwe (Carton Thompson, 1931). Within the South African context similar work was conducted on top of Mapungubwe hill and K2 sites by Leo Fouche in 1933. Generally the farming communities in southern Africa is represented by remnants of settled villages with distinctive ceramics, grinding stones, stonewalls, livestock enclosures, agricultural terraces and these attributes show long term settlement in the region (Maggs, 1980; Loubser, 1988).

Various theories have been put forward to explain the development of farming communities, the most plausible being that farming communities occurred as a results of early population movement from further north (Phillipson, 1977; 1985; 2005; Huffman, 1970; 2007; Pwiti, 1991; Soper, 1971; 1982; Maggs, 1984; Collet, 1982). Despite this, however archaeologists are still grappling with the nature of farming communities spread and expansion to central and southern Africa (Ehret, 2002; Huffman, 1989; Sutton, 1994/5; Pikirayi, 2007). There is still disagreement and uncertainty on the nature of the movement or their area of origin. Bantu Migrations was certainly no longer seen as a realistic way of interpreting farming communities' movement (Collet, 1982).

Topography, drainage system and good climatic conditions could have influenced these societies to settle in this region. The influence of the natural environment is undisputable, although it is not deterministic (Katsamudanga, 2007). The

proposed studies are quite often stimulated by the development of new research methods, new theories or mere need to understand cultural development in previously unexpected areas. It is the aim of this study to interrogate the archaeological character of the study area in order to trace the origin and development of these Farming Communities within the Soutpansberg Mountains. The decision to investigate within the proposed study area was influenced by a number of factors, First and foremost was the location of archaeological sites in close proximity to water sources. The location of settlement in close proximity to or association with some elements of environment should be related to what the environment offers as opportunities for survival. Secondly farming communities sites are not well understood because of limited research conducted within the region to date. Existence of these archaeological sites within the region is acknowledged, however these sites never received serious archaeological attention. Research coverage has been skewed towards the middle Limpopo valley which may be associated with very early state systems in southern Africa (Huffman, 2007).

Greatest credits should be directed to archaeologists for their recent dramatic advances in our understanding of the early societies of South Africa. They have long since laid to rest the well-worn myth that African communities arrived south of the Limpopo at much of the same times as whites first settled in the Western Cape. Archaeological research has recorded the existence of cultural material remains in which human occupation is made up of pre-colonial elements (Stone Age and Iron Age) as well as Missionaries and the colonial farmer's component.

Cultural material finger prints such as pottery fragments, iron smelting material components (slag, tuyere and furnaces) remains of grain bins, hut floors, stone enclosures and walls are the true evidence which reflected that early humans lived here, discontinuously, for thousands of years, from the Early Stone Age, through what is known as the Middle Stone Age, and well into the Late Stone Age. Evidence that confirm the existence and the presence of Stone Age people within study area is confirmed by the occurrence of stone tools

(scraper, blades, core and flakes) dating to the Middle and Late Stone Age. The majorities of finds are classified as isolated surface occurrences, and such finds are judged to have a low significance and they require no mitigation measures.

Iron Age people moved into southern Africa by c. AD 200, entering the area either by moving down the coastal plains, or by using a more central route. It seems more likely that the first option was what brought people into the study area. From the coast they followed various rivers inland. They moved south of the Limpopo River into areas previously habituated only by Stone Age people (hunter gatherers) they started to clear vegetation, the inland; valley sites seem to have been located on fertile soil and suggest they were cultivated previously. There is a wide array of evidence that support this notion, numerous grain bin foundations, grinding stones were noted in many archaeological sites in the Soutpansberg region, most of these sites were located adjacent to water source. More than 1500 sites are currently known within the Soutpansberg region, those that have been investigated by archaeologist have yielded a number of radio carbon dates covering a broad time span. According to Maggs (1986) the Lowveld was occupied on an increasingly extensive scale from the fifteen century onwards, it is at this time that the Late iron age brought significant changes in the patterns of land occupation, architectural style and building techniques marked by extensive use of stones for building.

Iron Age sequence owes much to the work undertaken by Menno Klapwijk (1974), in the Tzaneen area, and Helgaard Prinsloo (1974) in Happy rest and Klein Africa Soutpansberg region, these Iron age sites were specifically referred to as the earliest known site component of the Iron Age period. The site Silver Leaves was occupied in the third century, being dated by radiocarbon to circa 280 AD. Similar dates also came from Eiland sites discovered few kilometres south east of Tzaneen in the then Northern Transvaal. On both sites, direct evidence of cultivation was extremely limited, but impressions of *Pennisetum* millet seeds were discovered. This was the principal evidence of the earliest Iron Age penetration with the then dominant crop being brought in and introduced to the area (Klapwijk 1974).



More recently Iron Age site which date to 750AD has been found further south of the Soutpansberg Mountain, the site was excavated as part of archaeological site rescue excavation for the development of Nandoni dam. Iron Age occupation of the Soutpansberg region seems to have taken place on a significant scale were they introduce metallurgy and worked with copper and iron. Sites dating to the Early Iron Age are known to occur to the west of the Nzhelele valley at Klein Africa and Happy Rest these sites were first identified by De Vaal (1941) and were later excavated by Helgaard Prinsloo (1974) . During his excavations process Prinsloo uncovered human skeletal remains which was later described as a male individual with Negroid characteristics buried on a sitting position. Early and Late Iron Age occupation occurs throughout the Soutpansberg region, especially to the north. Most Late Iron Age sites have been dominated by typical stone walls; these sites can be linked with Venda- speaker and date to the period 1500-1600AD. Linguistic and archaeological evidence indicate that these Iron Age inhabitants were most likely the ancestors of the pre- Venda (Vhangona). Vhavenda of today are generally viewed as fully outside of great Nguni communities and are decedents of many heterogeneous groups, with multiple versions on their origin. According to Loubser(1988;1991) there are two school of thought that dominate the interpretation of the VhaVenda origin with the early school emphasizing migration from central Republic of Congo and the current school emphasizing autochthonous development. According to Stayt and Van Warmelo the pre-Venda unification (before 1500AD) has placed Vhangona as the earliest communities who occupied the Soutpansberg before the Singo arrived.

The oldest settlements in the Soutpansberg area ever recorded have one or several livestock dung concentration (Loubser, 1988). This type of settlement schema fit well with what have been developed by Kuper (1982b) and Huffman (2007) as Central Cattle Pattern. The settlement is characterised by cattle kraal at the centre of the settlement, used as burial places for high status individual. The huts are arranged around the kraal, presence of sunken grain storage and grain pits (Huffman 2007:25). The model has been derived from the eastern Bantu ethnographic model that shares a Patrilineal ideology, where

Men are associated with pastoralist and women with agriculture (Kuper, 1982b). These types of settlement are similar in the arrangement of livestock enclosures; however separation of adult livestock and calves enclosures have been identified (Huffman, 2007).

These types of settlement reflect socio-economic reality where cattle have a high Symbolic and religious significance as reflected in the position of their enclosures (Maggs, 1976). Evidence for the CCP has been reported from Early Iron Age sites in South Africa, including Ndondondwane (Greenfield et al. 2000; Greenfield & van Schalkwyk 2003, Greenfield and Miller, 2004), Nanda (Whitelaw, 1993) and Kwagandaganda (Whitelaw, 1994) in Kwazulu Natal as well as Broederstroom (Huffman, 1990; 1993) in the North West Province.

Zhizho sites are found in southwest Zimbabwe, adjacent parts of Botswana as well as the Limpopo Valley (Robinson, 1960; Huffman, 1973; 1984; Hanisch, 1980; Denbow, 1982). It is projected that most of the Zhizho sites conform to the Central Cattle Pattern.

Hanisch (1980) encountered two settlement patterns during his excavations of the Early Iron Age sites in the vicinity of Schroda and Pont drift within the Limpopo Valley. The lower level was dominated by the presence of hut floors, and absence of livestock kraal in the central part. The second pattern was characterised by small kraals amongst the huts. There is absence of large kraals, but rather a series of smaller ones occur in the central part of the site. Huts were erected around the central area thereby protecting livestock. Section of the site was utilised as midden. The second village differ with the first village in that huts do not surround the kraal and midden. Kraal and midden were placed up right against the rocky outcrop. At Pont drift, Hanisch found very few living huts remains on top of the ridge. The huts occurred in association with grain bins remains. The settlement observed as a large village compartmentalised into smaller units (Hanisch, 1980).

Also worth noting in this context is the work by Murimbika (2006) at K2 site in the Limpopo Valley. Murimbika (2006) drew conclusion that K2 site started as a Central Cattle Pattern, but at some point cattle were shifted from the centre. This change was interpreted as a major shift in spatial organization, which corresponds to change in socio political and economic relationship. Cattle were separated from the central space. According to Murimbika (2006) these shifts reflect the rise of a new form of wealth associated with the East Coast Trade Network.

Until recently, it was widely accepted that Central Cattle Pattern dominates the Early and Middle Iron Age sequences. However there is reaction levelled against the CCP pattern (Hall, 1987; Badenhorst, 2010). Some of the issues raised are what informs settlement patterns on those Iron Age communities without domestic livestock? Indirect evidence suggesting the likelihood of the absence of CCP in the Early Iron Age occupation may be seen in the absence of livestock kraals (Badenhorst, 2010).

The CCP Pattern which was advocated by Kuper (1982) and Huffman (2007) as settlement model for Early Iron Age settlement did not seem to be applicable on Mut2/2 Early Farming Community site, largely due to the fact that no cattle byres were found. The central section of the site had high concentration of structures and features and was most probably the area with the highest population and with most activities. Some of the examined grain storage pits had large dung mixture linings and they were filled up with ash and potsherds, suggesting that the pits were used as rubbish disposal. No dung deposit could be found in the village horizon (Archaeo- info, 2000).

The first Millennium AD Central Cattle Pattern lacks stone construction, with the economy characterised by livestock's and agriculture (Maggs, 1976; 1980; 1984). There is very limited evidence that shows that trade with the coast did take place (Mason, 1962: 431). During the Middle Iron Age (AD 900-1300) significance changes occur, settlements were located in uplands (Maggs and Wards, 1984), hilltops and promontory raised area (Loubser, 1988). This settlement pattern could have been altered by the socio-political development in the Limpopo Valley.

There was an over whelming farming production, co-ordination and control over economic, social and religious activities.

Stone building became regular feature of farming communities especially south of the Zambezi (Mason, 1969). Arrival of Nguni and Sotho Tswana speakers in southern Africa brought with new building style, different settlement locations, ceramic and other form of material culture (Badenhorst, 2010). They interacted with other absorbed farmers that already lived in the region before (Hammond-Tooke, 2004,; Huffman, 2007; Hall, 1986; Mitchell, 2002; Philipson, 2005). This intensified farming activities and the dominance of cattle in the region (Badenhorst, 2010). Various states appeared during the second millennium AD following the development within the Limpopo Valley, this includes Great Zimbabwe, Khami and Venda all associated with Shona and Venda (Huffman, 2007; Mitchell, 2002).

The late Iron Age (AD 1300-1820s) is mostly characterised by socio political complexity, higher population, environmental degradation, intensive hunting, overgrazing and extensive use of stones as construction materials (Maggs, 1976; Badenhorst, 2009). Before the arrival of the Late Iron Age farmers, there is little evidence suggesting the dominance of stone constructions. In fact, available evidence rather suggests absence of stone constructions on precursor Early Iron Age sites.

Presences of stone terraces have been recorded in agricultural ploughing zones. Terraces are part of important principles and agricultural practice. They occur when the scattered stones are cleared from the main field and placed in row of lines for easy cultivation . According to Rodriguez (2006) Smith and Price (1994) Badenhorst (2010) terraces control soil erosion and increase crop production. Variety of crops grows very well in terraces land, because burnt vegetation leaves ash as fertilizer which promotes growth of certain plants.

Terraces date to the second millennium AD and are commonly associated with sites using stone construction dating mostly to the Late Iron Age (cf. Evers, 1980; Mason, 1969). Stone terraces have been recorded throughout southern Africa for example highland of eastern (Soper, 2002) other parts of Zimbabwe (Robinson, 1966), Limpopo and Mpumalanga (Collet, 1982; Evers, 1973; 1975; 1981; Mason, 1968; Marker and Evers, 1976; Plug and Pistorius, 1999; Trevor, 1930; Van der Merwe and Scully, 1971). These terraces were used for agricultural and settlement purposes. Some of the investigated terraces walls had evidence of remains of small houses built in the middle (Pistorius et al. 2001; Van der Merwe and Scully, 1971). Middle and Late Iron Age periods settlements have been recorded north and south of Soutpansberg Mountains. According to Loubser (1988: 35) they are located in variable areas for example, on top of the mountain, hilltop and raised areas. Syntheses of ethnographic data by Loubser (1988) shows that most of these settlements categorized by the presence of stonewall and these ruins were ethnographically associated with the royal families ascribed to early Vha-Venda, Sotho and Shangaans.

Historical documents suggest that the Shangaans originated from the Zulu. This movement came in light during the fierce war of extermination- The Mfecane/Difacane that broke out at the beginning of the 19<sup>th</sup> century. Shaka defeated the Kingdom of amaNdwandwe which was led by King Zwide along the Mhlatuze River and incorporated into the mighty Amazulu Kingdom. It was during this time period when Soshangana broke away immediately after the defeat of Zwide in 1819 and entered Mozambique at around 1820. The overpowered the indigenous groups (The Tsonga, Ndawu (Vandau) Vahlengwe, Vanyai, Varhonga, Vachopi, Vatswa, Mashona, Vahlave, Vadzonga and other groups) and eventually incorporated them. Soshangana led a kingdom of about 500000 to 2000000 subjects stretching from close to Nkomati River in the south, to the Zambezi and Pungwe River in the south and the Indian Ocean in the East to the Drakensberg and Soutpansberg and the eastern Zimbabwe. The direct authority extended over the whole of what is known as southern Mozambique, large part of western Zimbabwe, Limpopo and Mpumalanga Provinces (Liesegang 1975, Myburgh, 1949, Omer-Cooper, 1988:59)

Soshangana aka Manukuze (1760-1858) was the son of Zikode and was the grandson of Gaza, after whom the kingdom was named. He established the capital at Chaimite, that later became a sacred village and the area where they lived was known as ka Shangana and they were referred to as Mashangana, after Soshangana. Between 1825 and 1827 Soshangana lived on the tributary of Nkomati River. From 1827 to 1834 his residence was in the lower Limpopo valley. In 1835 he moved with his troops to Musapa in the present day Melssetter District (between Mussurize-Manica and chipinge) in Zimbabwe. In 1839 as a result of the small pox epidemic in which he lost many of his warriors, he returned to their earlier home in the Limpopo valley, Bileni, leaving his son, Mzila to place the north of Zambezi under his tribute.

King Mzila, son of soshangana was Ngungunyani's father; he was born around 1845-50 at Bileni in the Gaza Province. In 1859 to 1861 he stayed at the Soutpansberg within the Transvaal. In 1862 to 1889 he stayed at Masapa melster District with his capital called Mandlakazi in Chipinge in Zimbabwe. As a young man he spend most of this time preparing for military training and for governance. Documents suggest that Ngunguyani had twenty children. When king soshangana passed away in 1858 and his grandson Ngungunyani was only 13 years old. King Soshangana was succeeded by his son, Mawewe, and after a protracted civil war, Mawewe was dethrone by his half-brother Mzila, who ruled the kingdom for 23 years (1861-1884). He died in 1884 and he was succeeded by his son, Ngunguyani in 1884, king Ngungunyain was not the only son of king Mzila. There were other brothers like Mafemane and Komokomo. They were eligible successors to Mzila as a king. On Mzila's death Ngungunyani's supporters amongst them one of the kings brother and few military officers acted quickly. Mafemane, the main competitor was killed before a major confrontation, like that after Soshangana's death in 1858, could develop. The other brother was not attacked however he was executed at the court between 1893 and 1895 (Liesegang, 1975).

## 9. CHRONOLOGICAL SEQUENCE OF THE STONE AND IRON AGE

The Stone Age is the period in human history when lithics (or stone) was mainly used to produce tools. In South Africa the Stone Age can be divided basically into three periods. It is important to note that these dates are relative and only provide a broad framework for interpretation. A basic sequence for the South African Stone Age is as follows:

Early Stone Age (ESA): complex	Predominantly the Acheulean hand axe industry dating to + 1Myr yrs-250 000 yrs. Before present.
Middle Stone Age (MSA):	Various lithic industries in SA dating from $\pm$ 250 000 yr.- 30 000 yrs. before present.
Late Stone Age (LSA):	The period from $\pm$ 30 000-yr.to contact period with either Iron Age farmers or European colonists.

There are no known Stone Age sites in the area including rock art. No Stone Age sites or objects were recorded during the assessment of the area.

The Iron Age is the name given to the period of human history when metal was mainly used to produce artifacts:

Early Iron Age (EIA):	Most of the first millennium AD
Middle Iron Age:	10 <sup>th</sup> to 13 <sup>th</sup> centuries AD
Late Iron Age (LIA):	14 <sup>th</sup> century to colonial period. The entire Iron Age represents the spread of Bantu speaking peoples.

## 10. ASSESSMENT CRITERIA

This section describes the evaluation criteria used for determining the significance of archaeological and heritage sites. The significance of archaeological and heritage sites were based on the following criteria:

- The unique nature of a site

- The amount/depth of the archaeological deposit and the range of features (stone walls, activity areas etc.)
- The wider historic, archaeological and geographic context of the site.
- The preservation condition and integrity of the site
- The potential to answer present research questions.

### **10.1. Archaeological**

No archaeological materials were found in the study area.

### **10.2. Historical**

No historical sites/materials found on site.

### **10.3. Burial grounds and graves**

No graves were identified on site

The legislation also protects the interests of communities that have an interest in the graves: they should be consulted before any disturbance takes place. The graves of victims of conflict and those associated with the liberation struggle are to be identified, cared for, protected and memorials erected in their honor.

Graves older than 60 years, but younger than 100 years, fall under Section 36 of Act 25 of 1999 (National Heritage Resources Act) as well as the Human Tissue Act (Act 65 of 1983) and are under the jurisdiction of the South African Heritage Resources Agency (SAHRA). The procedure for Consultation regarding Burial Grounds and Graves (Section 36(5) of Act 25 of 1999) is applicable to graves older than 60 years that are situated outside a formal cemetery administered by a local authority. Graves in the category located inside a formal cemetery administered by a local authority will also require the same authorization as set out for graves younger than 60 years, over and above SAHRA authorization.



In terms of the Section 36 (3) of the National Heritage Resources Act, 1999 (Act No. 25 of 1999) no person may, without a permit issued by the relevant heritage resources authority:

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

(b) destroy, damage, alter, exhume or 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

(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.

Therefore, in addition to the formal protection of culturally significance graves, all graves which are older than 60 years and which are not already located in a cemetery (such as ancestral graves in rural areas), are protected. Communities, which have an interest in the graves, must be consulted before any disturbance can take place. The graves of victims of conflict and those associated with the liberation struggle will have to be included, cared for, protected and memorials erected in their honor where practical. Regarding graves and burial grounds, the NHRA distinguishes between the following:

- Ancestral graves
- Royal graves and graves of traditional leaders
- Graves of victims of conflict
- Graves of individuals designated by the Minister by notice in the Gazette
- Historical graves and cemeteries
- Other human remains, which are not covered in terms of the Human Tissue Act, 1983 (Act No.65 of 1983).

#### **10.4. Significance valuation Burial Ground, Historic Cemeteries and Graves**

The significance of burial grounds and gravesites is closely tied to their age and historical, cultural and social context. Nonetheless, every burial should be considered as of high significance. Should any grave previously unknown be identified during construction, every effort should be made not disturb them. The streets designs should be shifted to ensure the grave or burial ground is not disturbed.

#### **10.5. Previously unidentified burial sites/graves –**

Although the possibilities of this occurring are very limited, should burial sites outside the NHRA be accidentally found during the proposed development, they must be reported to the nearest police station to ascertain whether or not a crime has been committed. If there is no evidence for a crime having been committed, and if the person cannot be identified so that their relatives can be contacted, the remains may be kept in an institution where certain conditions are fulfilled. These conditions are laid down in the Human Tissue Act (Act No. 65 of 1983). In contexts where the local traditional authorities give their consent to the unknown remains to be re-buried in their area, such re-interment may be conducted under the same regulations as would apply for known human remains.

### **11. HE SIGNIFICANCE OF GRAVES AND BURIAL SITES**

The significance of burial grounds or graves has been indicated by means of stipulations derived from the National Heritage Resources Act (Act No 25 of 1999)

Heritage Significance	:	GP.A; High/Medium Significance
Impact	:	Negative
Impact Significance	:	High
Certainty	:	Probable
Duration	:	Permanent
Mitigation	:	C

- *Informal graves and Formal grave yards (Cemeteries)*

Informal and formal grave yards (Cemeteries) can be considered to be sensitive remains of high significance and are protected by various laws. Legislation with regard to graves includes the National Heritage Resources Act (no 25 of 1999) this act applies whenever graves are older than sixty years. The act also distinguishes various categories of graves and burial grounds. Other legislation with regards to graves includes those which apply when graves are exhumed and relocated, namely the Ordinance on exhumation (Ordinance no 12 of 1980) and the Human Tissue Act (Act no 65 of 1983 as amended).

### **11.1. Site significance**

The site significance classification standards as prescribed and endorsed by the South African Heritage Resources Agency (2006) and approved by the Association for Southern African Professional Archaeologists (ASAPA) for the Southern African Development Community (SADC) region, were used as guidelines in determining the site significance for the purpose of this report.

<b>FIELD RATING</b>	<b>GRADE</b>	<b>SIGNIFICANCE</b>	<b>RECOMMENDED 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)	Grade 4A	High / Medium Significance	Mitigation before destruction
Generally Protected B (GP.B)	Grade 4B	Medium Significance	Recording before destruction
Generally Protected C (GP.C)	Grade 4C	Low Significance	Destruction

Grading and rating systems of heritage resources

## **11.2. Impact rating**

### **VERY HIGH**

These impacts would be considered by society as constituting a major and usually permanent change to the (natural and/or cultural) environment, and usually result in severe or very severe effects, or beneficial or very beneficial effects.

**Example:** The loss of a species would be viewed by informed society as being of VERY HIGH significance.

**Example:** The establishment of a large amount of infrastructure in a rural area, which previously had very few services, would be regarded by the affected parties as resulting in benefits with VERY HIGH significance.

## **HIGH**

These impacts will usually result in long term effects on the social and /or natural environment. Impacts rated as HIGH will need to be considered by society as constituting an important and usually long term change to the (natural and/or social) environment. Society would probably view these impacts in a serious light.

**Example:** The loss of a diverse vegetation type, which is fairly common elsewhere, would have a significance rating of HIGH over the long term, as the area could be rehabilitated.

**Example:** The change to soil conditions will impact the natural system, and the impact on affected parties (e.g. farmers) would be HIGH.

## **MODERATE**

These impacts will usually result in medium- to long-term effects on the social and/or natural environment. Impacts rated as MODERATE will need to be considered by the public or the specialist as constituting a fairly unimportant and usually short term change to the (natural and/or social) environment. These impacts are real, but not substantial.

**Example:** The loss of a sparse, open vegetation type of low diversity may be regarded as MODERATELY significant.

**Example:** The provision of a clinic in a rural area would result in a benefit of MODERATE significance.

## **LOW**

These impacts will usually result in medium to short term effects on the social and/or natural environment. Impacts rated as LOW will need to be considered by society as constituting a fairly important and usually medium term change to the (natural and/or social) environment. These impacts are not substantial and are likely to have little real effect.

**Example:** The temporary changes in the water table of a wetland habitat, as these systems are adapted to fluctuating water levels.

**Example:** The increased earning potential of people employed as a result of a development would only result in benefits of LOW significance to people living some distance away.

## **NO SIGNIFICANCE**

There are no primary or secondary effects at all that are important to scientists or the public.

**Example:** A change to the geology of a certain formation may be regarded as severe from a geological perspective, but is of NO SIGNIFICANCE in the overall context.

### **11.3. Certainty**

*DEFINITE* : More than 90% sure of a particular fact. Substantial supportive data exist to verify the assessment.

*PROBABLE* : Over 70% sure of a particular fact, or of the likelihood of an impact occurring.

*POSSIBLE* : Only over 40% sure of a particular fact, or of the likelihood of an impact occurring.

*UNSURE* : Less than 40% sure of a particular fact, or of the likelihood of an impact occurring.

### **11.4. Duration**

*SHORT TERM* : 0 – 5 years

*MEDIUM* : 6 – 20 years

*LONG TERM* : more than 20 years

*DEMOLISHED* : site will be demolished or is already demolished

### **11.5. Mitigation**

Management actions and recommended mitigation, which will result in a reduction in the impact on the sites, will be classified as follows:

- **A** – No further action necessary
- **B** – Mapping of the site and controlled sampling required
- **C** – Preserve site, or extensive data collection and mapping required; and
- **D** – Preserve site

## **12. CONCLUSIONS AND RECOMMENDATIONS**

No further studies / Mitigations are recommended given the fact that within the proposed Township Establishment area and its surrounding there are no archaeological or place of historical significance to be impacted by the proposed project development. However, should any chance archaeological or any other physical cultural resources be discovered subsurface, heritage authorities should be informed. From an archaeological and cultural heritage resources perspective, there are no objections to the proposed Township Establishment. We recommend to the Provincial Heritage Resource Agency, South African Heritage Resource Agency to approve the project as planned.

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**GEOTECHNICAL INVESTIGATION FOR THE PROPOSED TOWNSHIP SITUATED ON TSHIKOTA  
EXT 3 ON THE REMAINDER OF PORTION 1 OF THE FARM NATURELLE LOKSASIE 272 LS  
UNDER THE JURISDICTION OF MAKHADO LOCAL MUNICIPALITY, LIMPOPO PROVINCE OF  
SOUTH AFRICA**

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00	28/09/2021	Lavhelesani Mavhetha (Pr.Sci.Nat) 	Final Report

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## ACRONYMS AND ABBREVIATIONS

<b>AASHTO</b>	: American Association of State Highway and Transportation Officials
<b>ARS</b>	: Acceleration Response Spectra
<b>DCP</b>	: Dynamic Cone Penetrometer
<b>DSI</b>	: Dolomite Stability Investigation
<b>CBR</b>	: Californian Bearing Ratio
<b>M</b>	: Meter
<b>MDD</b>	: Maximum Dry Density
<b>MBGL</b>	: Meters Below Ground Level
<b>NHBRC</b>	: The National Home Builders Registration Council
<b>OMC</b>	: Optimum Moisture Content
<b>CL</b>	: Clay
<b>TP</b>	: Trial Pit
<b>TLB</b>	: Tractor Loader Backhoe
<b>SANS</b>	: South African National Standards
<b>SANAS</b>	: South African National Accreditation System
<b>SACNASP</b>	: South African Council Natural Scientific Professions
<b>USC</b>	: Unified Soil Classification

## EXECUTIVE SUMMARY

<b>Client</b>	Ngoti Development Consultants
<b>Consultant Company</b>	Mang Geo-Enviro Services
<b>Site location</b>	The site for the proposed development is located at the remainder of Portion 1 of the farm Naturelle Loksasie 272 LS in Tshikota Village.
<b>Purpose of investigation</b>	The investigation was aimed at assessing materials and establishing the specific site geotechnical conditions and recommendation
<b>Regional geology</b>	The area is underlain by a Goudplaats Gneiss Basement, forming the foundation for a relatively flat and undulating topography. The gneiss is biotite rich and predominates the geology. The sequential Schiel Complex, which intruded the gneisses, consists of porphyritic syenite. The younger Vaalian age granites, which are leucocratic, muscovite- and biotite rich, intruded the basement complex. Granite and gneiss outcrops are sparsely distributed, although a syenite outcrop to the south of Levubu, and a biotite-muscovite granite outcrop to the east of Levubu are apparent. Numerous diabase dykes have intruded across the area, trending in a north-east direction.
<b>Excavation conditions</b>	Excavation conditions across much of the site should be categorized as “soft mechanical excavation” to about 1.0m below existing ground level. “Intermediate mechanical excavation” is to be expected with depth on highly weathered granite bedrock. No outcrops of weathered granite bedrock were encountered during this investigation on site. This is a good indication for the behavior of the materials; excavated ground must retain its stature vertically without unsupported.
<b>Top layer</b>	Topsoil layer was observed in all of the trial pits. The material didn't show road bearing capacity. There was no sample taken from this layer. The layers had an average thickness of 0.25m thick and it was dominated by brownish silty sand.
<b>Laboratory Results</b>	The site samples indicated a grading modulus ranging from 0.25 to 1.34. Based on the grading modulus, Atterberg limits and grading analysis, the PI along with the clay content indicated that the samples exhibit high to very high potential expansiveness. The sample indicated CBR of 1 at 95% MOD AASHTO with a grading modulus of 0.93 for TP3. The sample indicated CBR of 3 at 95% MOD AASHTO with a grading modulus of 1.34 for TP7. Based on the grading modulus,

	<p>Atterberg limits and CBR the sample were classified as A-7-6(8) material according to HRB (AASHTO) classification.</p> <p>pH measurements conducted indicated that the pH of the area range from 6.2 – 6.7 (Acidic). Conductivity measurements indicated that the conductivity of the area range from 0.016 to 0.038 Ms/m. The area can be safely classified as Non-corrosive (NC). Having said that, does not mean corrosive Materials (pipelines) installation must not include measures against corrosion.</p>
<p><b>Conclusion and recommendations</b></p>	<p>A review of the test pit data indicates that the site is generally underlain by highly weathered granite bedrock. The laboratory tests indicated that material underlying the site exhibits high to very high potential expansiveness. The development potential has been broadly classified in terms of a Geotechnical Sub-Area based on field observations/investigation (geological, hydrogeological, and geomorphological), and laboratory soil testing of soil samples. According to AASHTO the soil samples were classified as A-7-6(8) the foundation design options as per SANS10400 H- NHBRC soil symbol is “<b>S1/H2</b>”. The recommended Foundation types in accordance with SANS 10400H- soil raft/Stiffed or cellular raft/ Piled or split Construction</p>

## 1. INTRODUCTION

Mang Geo Environmental Consultants was appointed by Ngoti Development Consultants on behalf of Makhado Local Municipality to carry out a near surface geotechnical investigation study for the proposed Township establishment. The proposed development will materialize on a site that is approximately 20.65 hectares in size on remainder of portion 1 of the farm Naturelle Loksasie 272 LS in Tshikota Village under the jurisdiction of Makhado Local Municipality, Limpopo Province of South Africa.

## 2. OBJECTIVES OF THE STUDY

The investigation was aimed at assessing materials and establishing the specific site geotechnical conditions and recommendation.

The following are some of the objectives of geotechnical investigation:

- To establish in broad terms, the nature and relevant engineering properties of the upper soil and rock strata underlying the site.
- Soil chemistry tests including pH determination and Electrical Conductivity tests.
- To comment on suitable excavation procedures for the installation of services.
- To present general foundation recommendations for the proposed development.
- To comment on any other geotechnical aspects as these may affect the development.

## 3. TERMS OF REFERENCE

The study was requested by Ngoti Development Consultants on behalf of Makhado Local Municipality. The main objective was to conduct a geotechnical investigation at the site of the proposed township establishment Situated on the remainder of Portion 1 of the farm Naturelle Loksasie 272 LS in Tshikota Village Limpopo Province. The investigation comprised a test pits investigation and the soil/ laboratory tests.

We understand that the proposed development is to comprise of the following:

The proposed project entails the demarcation of 205 sites for:

- 202 residential use,
- 1 public open space,
- 1 business sites,
- 1 Creche and

- Streets.

## 4. INFORMATION SOURCES

The geotechnical investigation commenced with a desktop study using the existing geotechnical databases and maps pertaining, structural engineer specifications of the site were reviewed.

The following information was reviewed and consulted during the site investigation:

- Expansive Roadbed Treatment for Southern Africa: D J Weston (1980) 4<sup>th</sup> Int. Conf. on Expansive Soils, Vol. 1, Denver pp 339-360;
- Geological Map of South Africa from the database of Council For Geoscience: Scale 1: 100 000 Sheet – Geological series 2629CC/CD
- SAICE's Guidelines for Urban Engineering Geological Investigations;
- Schwartz, K. (1985). Collapsible soils. The Civil Engineer in South Africa, July, p379-393 and;
- South African Weather Service

## 5. SITE DESCRIPTION

### 5.1. LOCATION

The site for the proposed development is located at the remainder of Portion 1 of the farm Naturelle Loksasie 272 LS in Tshikota Village. The Geographical Positioning System (GPS) coordinates of the proposed development site is 23°52'25.62"S 29°3'8.28"E at an average elevation of 929 meters above sea level. The proposed site locality map is shown in Figure 1 below.



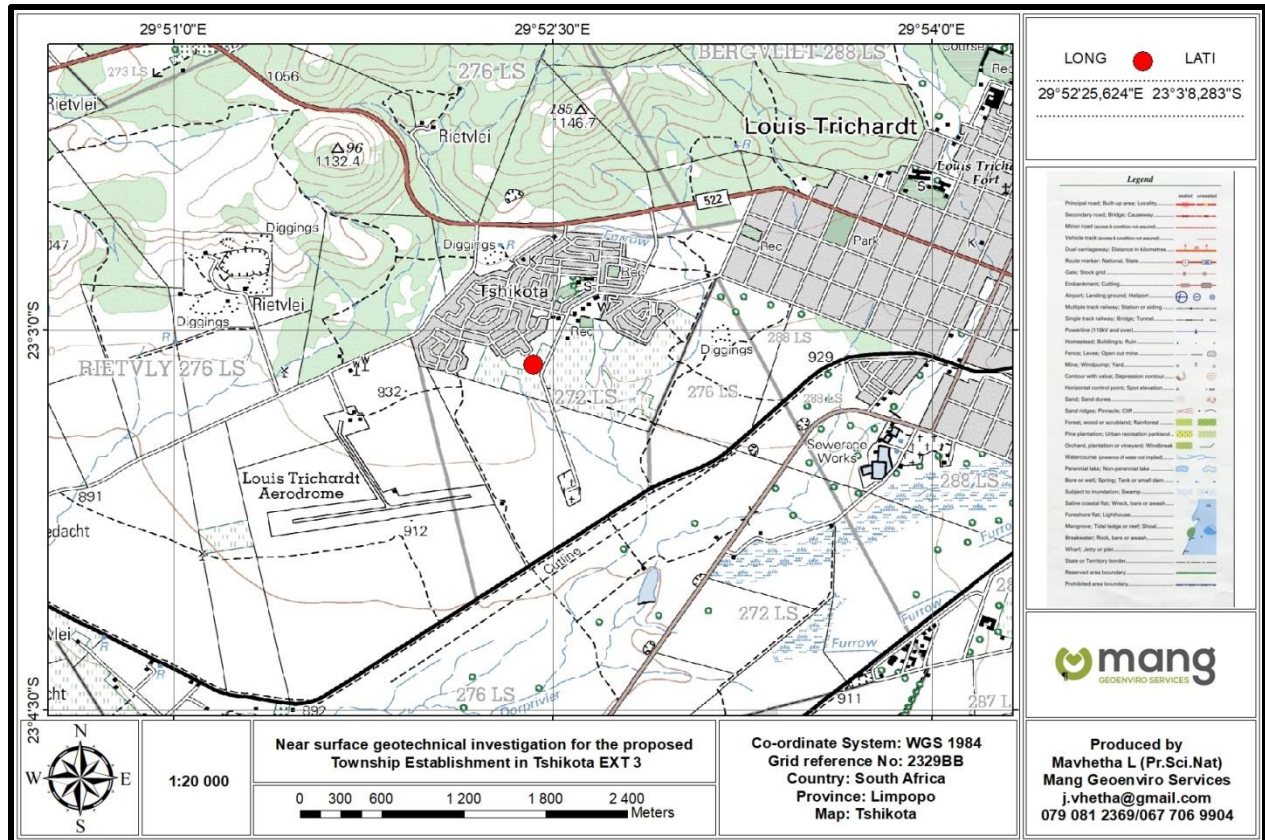


Figure 1: Locality map of the site

## 5.2. TOPOGRAPHY

The Vhembe District Municipality is characterized by both high-lying and low-lying areas. Its relief is divided into the lowveld in the east; the Limpopo valley in the north and northwest; the Soutpansberg region in the central part, and the Pietersburg plateau in the south. The altitude above sea level of the Vhembe District varies between 200m in the northeastern part of the area and over 1 500 m in the Soutpansberg mountain range.

## 5.3. CLIMATE

The climate in Tshikota is warm and temperate. In winter, there is much less rainfall than summer. The average annual temperature is 18.7°C. The rainfall in the area under investigation is around 793mm per year. The driest month is August with 9mm of rain. Most precipitation falls in January with an average of 153mm. January is warmest month of the year. The temperature in January averages 21.9°C. Moreover in June, the average temperature is 13.4°C, it is the lowest average temperature of the whole year. Furthermore, there is a difference of 144mm of precipitation between the driest and wettest months, with the average temperature varying during the year by 8.5°C.

## 5.4. VEGETATION

The Vhembe District Municipality is characterized by the Savanna biome and it covers approximately 98% of the vegetation with the remainder being made up of Forest (1%) and Grassland (0.2%) biome.



Figure 2: Vegetation cover of the site

## 6. GEOLOGY OF THE AREA

The area is underlain by a Goudplaats Gneiss Basement, forming the foundation for a relatively flat and undulating topography. The gneiss is biotite rich and predominates the geology. The sequential Schiel Complex, which intruded the gneisses, consists of porphyritic syenite. The younger Vaalian age granites, which are leucocratic, muscovite- and biotite rich, intruded the basement complex. Granite and gneiss outcrops are sparsely distributed, although a syenite outcrop to the south of Levubu, and a biotite-muscovite granite outcrop to the east of Levubu are apparent. Numerous diabase dykes have intruded across the area, trending in a north-east direction.

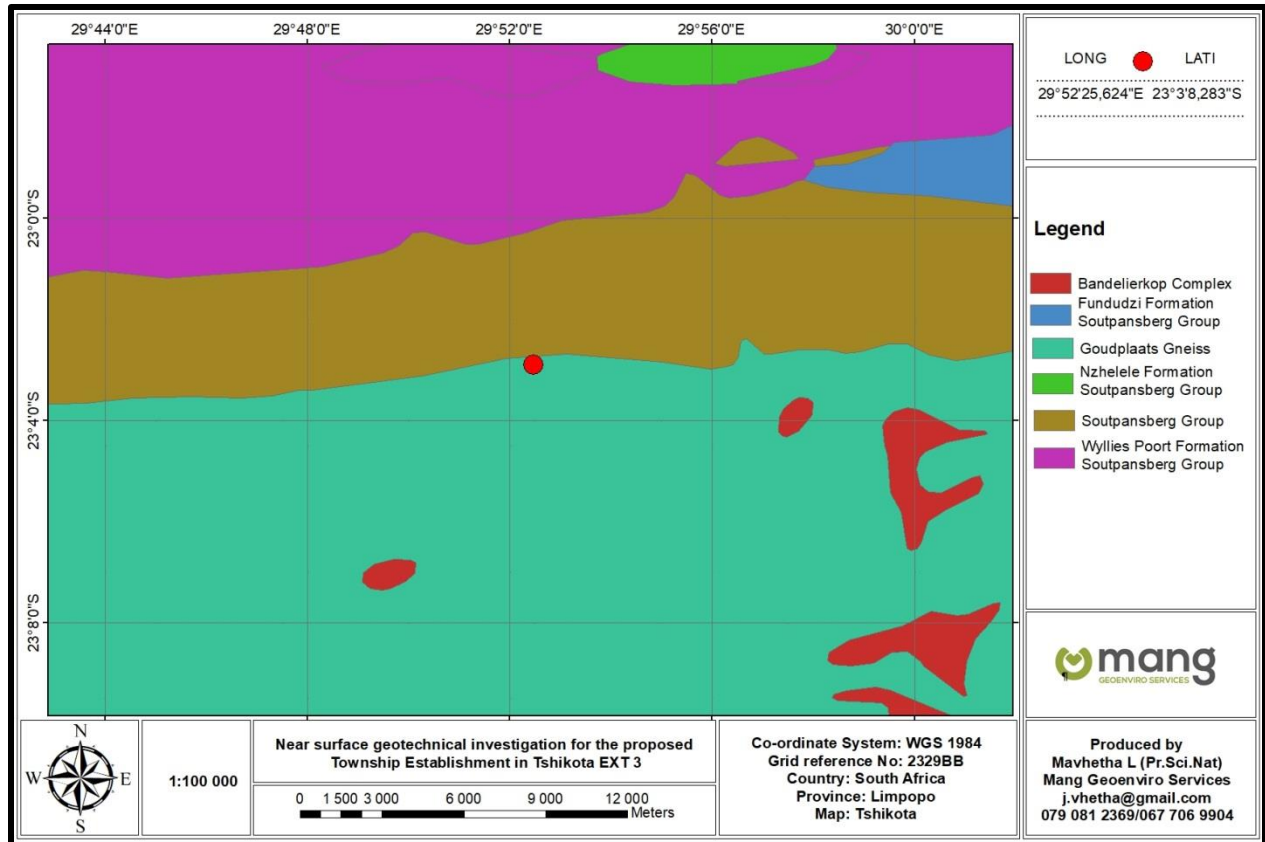


Figure 3: Geological setting of the site

## 7. SOIL PROFILE

### 7.1. TOP SOILS

The top soil is characterized by slightly moist to dry, brownish, firm to stiff, intact, Clay with the presence of organic matter (roots). The thickness of this layer ranges from 0-1m with an average of 0.52m

### 7.2. REWORKED RESIDUAL SOILS

Reworked residual soil was encountered in all test pits with an average thickness of 1.62m in the range 0.3m to 2.6m below ground level. This stratum is typically described as “Moist, light brown blotched grey, firm, slickensided, Sandy silty Clay.”

### 7.3. RESIDUAL SOILS

These soils originate from the in-situ weathering of bedrock which is underlined the site. The residual soils encountered on the site comprises of light brown blotched grey highly weathered residual granite.

**Table 1: Summary of the trial pits profile**

Test pits	Thickness of the layers			Water Seepage	End of hole	
	Top soils	Reworked residual soils	Residual Soils		Depth (m)	Material
	Silty clay	Sandy clay	Highly weathered bedrock			
TP 01	0-0.3m	0.3-0.8m	1.35m+	None	1.35m+	Sandy Clay
TP 02	0-1.0m	1.0-2.6m	2.6m+	None	2.6m	Clay
TP 03	0-0.6m	1.3-2m	2m+	None	2m	Clay
TP 04	0-0.7m	0.7-1.9m	2.7m+	None	2.7m	Clay
TP 05	0-0.45m	0.45-1.5m	2.8m+	None	2.8m	Clay
TP 06	0-0.5m	0.5-1.3m	2.75m+	None	2.75m	Clay
TP 07	0-0.5m	0.5-1.3m	2.58m+	None	2.58m	Clay
TP 08	0-0.58m	0.58-1.7m	2.7m+	None	2.7m	Clay
TP 09	0-0.4m	0.4-1.6m	2.8m+	None	2.8m	Clay
TP 10	0-0.48m	0.48-1.33m	1.33m+	None	1.33m	Sandy clay
TP 11	0-0.43m	0.43-1.8m	1.8m+	None	1.8m	Sandy clay
TP 12	0-0.34m	0.34-1.82m	1.82m+	None	1.82m	Sandy clay
TP 13	0-0.5m	0.5-2m	2m+	None	2m	Clay
TP14	0-0.5m	0.5-1.2m	2.35m+	None	2.35m	Clay
TP15	0-0.6m	0.6-1.3m	2.75m+	None	2.75m	Clay
TP16	0-0.68m	0.68-2m	2.8m+	None	2.8m	Clay
TP17	0-0.3m	0.3-1.4m	2.2m+	None	2.2m	Clay

TP18	0-0.5m	0.5-1.6m	2.4m+	None	2.4m+	Clay
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## 8. STUDY METHODOLOGY

The fieldwork was undertaken on the 12<sup>th</sup> August 2021 and comprised of the following:

- Desktop study
- Walk over survey and field mapping
- Test Pits
- Soil Sampling/ Laboratory Tests

### 8.1. DESKTOP STUDY

The investigation commenced with the conducting of the following actions:

- The compilation of base map showing identified land forms, regional geological setting and soils classification
- The study of geological investigation reports conducted within the vicinity of the site.

### 8.2. FIELD MAPPING

A walk-over survey was carried out on the proposed site to obtain as much information as possible of the subsurface conditions from existing soil. No rock outcrops were identified during this investigation other field testing discussed below.

### 8.3. INSPECTION OF TEST PITS

The investigation entailed the assessment and sampling of the subsurface materials. The test pits were placed on open grid spacing throughout the site in such a way as to accurately describe the general soil conditions occurring within the boundaries and the footprint of the proposed development. These were taken at various depths where the TLB excavation was terminated due to machine refusal at an average depth of 2.8m below existing ground level.

The succession of soil layers exposed within these pits were logged according to the industry-standard method proposed by Jennings et al (1973), and the soil samples deemed to be important to the proposed development were taken. The inspection pits were set out in the field using a hand held Garmin GPS and their location coordinates are indicated on the soil profiles attached in Appendix C of this report and test pit positions shown in figure 4.

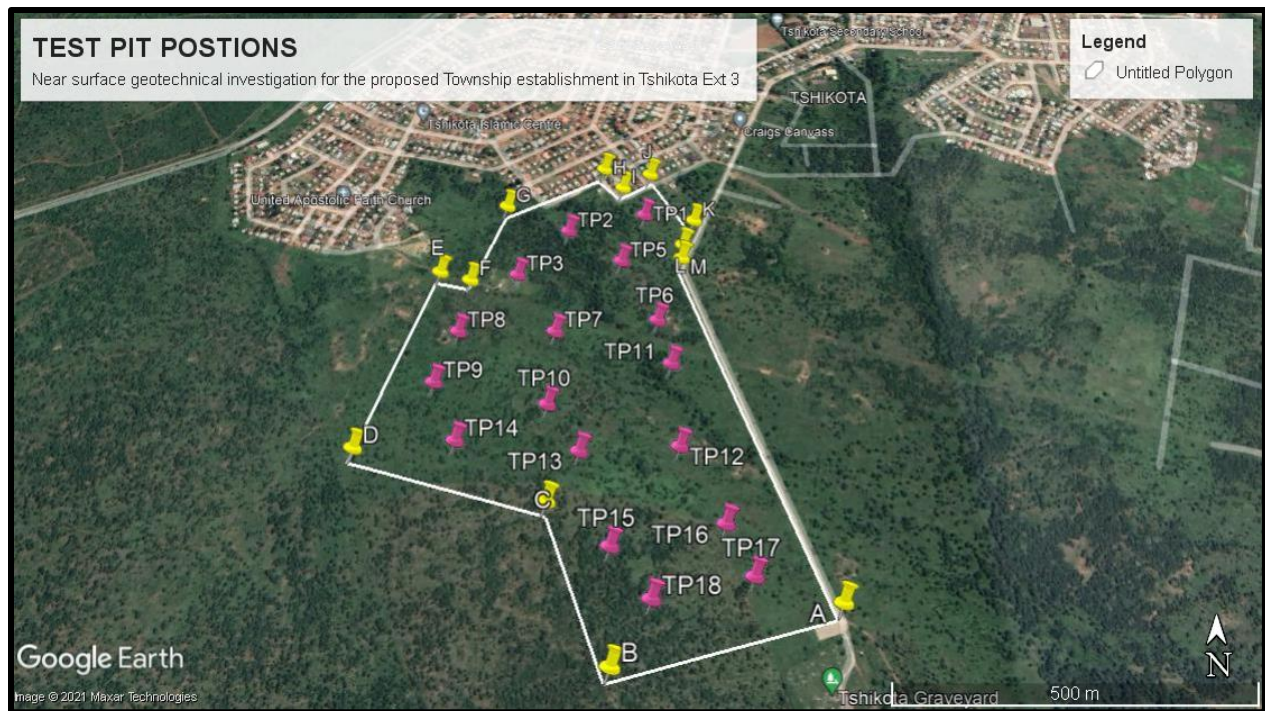


Figure 4: Test pit position

## 9. LABORATORY TESTING

The field work indicated a general homogeneity of the subsurface soils comprising of Moist, light brown blotched grey, firm, slickensided, Sandy silty clay. Representative disturbed and undisturbed subsoil samples retrieved from the inspection pits during the investigation were taken to a commercial laboratory for testing. These tests aid in assessing the behavior of soils due to moisture changes particularly below foundations. The following tests were conducted on soil samples taken during the field work phase by a suitable SANAS accredited soils laboratory (Civilab, Johannesburg (Booyens): Gauteng Province):

Standard foundation indicator tests were conducted on disturbed soil samples in order to determine its composition, to evaluate the heave and compressibility potential of these soils, and to calculate the maximum heave and/or differential settlement that can be expected. The following tests were conducted:

- 13 Atterberg Limits (plastic limit, liquid limit and plasticity index);
- 13 Grading analysis and;
- 2 MOD and 2 CBR,
- 2 pH and 2 Conductivity

The laboratory tests were conducted in order to assist with the classification, description, and delineation of homogenous zones. The results of the foundation indicator, MOD, CBR, pH and conductivity tests are presented in Appendix B and are summarized in Table 2 and Table 3 respectively.

The site samples indicated a grading modulus ranging from 0.25 to 1.34. Based on the grading modulus, Atterberg limits and grading analysis, the PI along with the clay content indicated that the samples exhibit high to very high potential expansiveness. The sample indicated CBR of 1 at 95% MOD AASHTO with a grading modulus of 0.93 for TP3. The sample indicated CBR of 3 at 95% MOD AASHTO with a grading modulus of 1.34 for TP7. Based on the grading modulus, Atterberg limits and CBR the sample were classified as A-7-6(8) material according to HRB (AASHTO) classification. pH measurements conducted indicated that the pH of the area range from 6.2 – 6.7 (Acidic). Conductivity measurements indicated that the conductivity of the area range from 0.016 to 0.038 Ms/m. The area can be safely classified as Non-corrosive (NC). Having said that, does not mean corrosive Materials (pipelines) installation must not include measures against corrosion.

**Table 2: Summary of the foundation indicator tests**

Sample No.	HRB (AASHTO)	Depth (m)	Atterberg Limit			GM	Grading analysis (%)				Potential expansiveness
			LL %	LS %	PI %		Clay	Silt	Sand	Gravel	
TP01	A-7-6(20)	0.8-1.35	62	16.0	33	0.54	50	17	26	6	Medium
TP02	A-7-6(20)	1-2.6	68	17.0	39	0.44	24	33	40	2	High
TP03	A-7-6(8)	0.6-2.0	50	10.0	23	0.93	41	20	28	11	Low
TP04	A-7-6(16)	0.7-1.9	52	12.0	26	0.54	38	24	36	2	Medium
TP05	A-7-6(20)	0.45- 1.5	68	16.0	38	0.25	42	37	20	1	Very High
TP06	A-7-6(20)	0.5-1.3	66	17.0	39	0.51	46	20	30	5	High to very High
TP07	A-7-6(4)	0.5-1.3	53	10.5	23	1.34	24	14	40	22	Medium
TP08	A-7-6(20)	0.54-1.7	68	15.0	39	0.37	49	27	22	2	Very high
TP09	A-7-6(20)	0.4-1.6	65	15.5	37	0.82	38	18	30	14	High



TP10	A-7-6(20)	0.48-1.33	68	16.5	42	0.45	49	23	25	4	Very High
TP11	A-7-6(20)	0.43-1.8	62	15.5	37	0.48	46	22	29	4	Medium
TP12	A-7-6(17)	0.34-1.82	52	12.0	27	0.56	44	21	30	5	Very high
TP13	A-7-6(12)	0.5-2.0	50	9.0	21	0.68	25	36	31	8	Medium

LL: Liquid Limit

PI: Plasticity Index

LS: Linear Shrinkage

GM: Grading Modulus

NP: Non-Plastic

**Table 3: Summary of the CBR test results**

Sample No.	HRB (AASHTO)	Depth (m)	CBR @						GM	Max. Swell (%)	OMC (%)	Max Dry Density (kg/m <sup>3</sup> )	COLTO Classification
			90%	93%	95%	97%	98%	100%					
TP03	A-7-6(8)	0.6-2.0	1	1	1	2	2	3	0.93	4.8	16.1	1674	-
TP07	A-7-6(4)	0.5-1.3	2	2	3	3	4	4	1.34	2.9	16.4	1773	-

PI: Plasticity Index

GM: Grading Modulus

OMC: Optimum Moisture Content

CBR: California Bearing Ratio

## 10. GEOTECHNICAL EVALUATION

This report focuses on the geotechnical site investigation aimed at determining various geotechnical properties of the near surface soil horizons in accordance with SAICE Code of Practice, SANS guidelines and NHBRC guidelines and the GFSH-2 document. Table 4 gives the basis of the soil site classification that was applied during the investigation and Table 5 gives the geotechnical classification for urban development

## 11. GEOTECHNICAL MAPPING OF THE SITE

In order to map the geotechnical characteristics of the underlying soils, the classification method proposed by the Joint Structural Division of SAICE and IstructE the Code of Practise entitled “Foundations and Superstructures for Single Storey Residential Buildings of Masonry Construction” has been used and is described in table 4 below.

**Table 4: Residential site Designation**

TYPICAL FOUNDING MATERIAL	CHARACTER OF FOUNDING MATERIAL	EXPECTED RANGE OF TOTAL SOIL MOVEMENTS (mm)	ASSUMED DIFFERENTIAL MOVEMENT (%OF TOTAL)	SITE CLASS
Rock (excluding mud rocks which may exhibit swelling to some depth)	STABLE	NEGLIGIBLE	-	R
Fine grained soils with moderate to very high plasticity (clays, silty clays, clayey silts and sandy clays)	EXPANSIVE SOILS	<7,5	50%	H
		7,5-15	50%	H1
		15-30	50%	H2
		>30	50%	H3
Silty sands, sands, sandy and gravelly soils	COMPRESSIBLE AND POTENTIALLY COLLAPSIBLE SOILS	<5,0	75%	C
		5,0-10	75%	C1
		>10	75%	C2
Fine grained soils (clayey silts and clayey sands of low plasticity), sands, sandy and gravelly soils	COMPRESSIBLE SOIL	<10	50%	S
		10-20	50%	S1
		>20	50%	S2

Contaminated soils, Controlled fill, Dolomitic areas, Landslip Land fill, Marshy areas Mine waste fill Mining subsidence Reclaimed areas Very soft silt/silty clays Uncontrolled fill	VARIABLE	VARIABLE		P
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**Table 5: Geotechnical classification for urban development (GFSH-2 Document)**

Geotechnical Sub-Area	Definition
1	Areas recommended or favorable for development
2	Areas where development can be considered with certain precautionary measures.
3	Areas that are not recommended for development

Other related engineering geological characteristics such as collapse settlement, compressibility, slope stability groundwater etc. were evaluated. The geotechnical properties relevant to the development are discussed below.

## 12. DEVELOPMENT RECOMMENDATIONS

From a geotechnical perspective, the site is considered suitable for the proposed development provided the recommendations given in this report are implemented.

### 12.1. EXCAVATION CONDITIONS

Excavation conditions across much of the site should be categorized as “soft mechanical excavation” to about 1.0m below existing ground level. “Intermediate mechanical excavation” is to be expected with depth on highly weathered granite bedrock. No outcrops of weathered granite bedrock were encountered during this investigation on site. This is a good indication for the behavior of the materials; excavated ground must retain its stature vertically without unsupported.

### 12.2. SIDEWALL STABILITY

No inherent slope stability issues were identified during the field investigation. Slope stability issues are unlikely to be a problem on this site.

### 12.3. GROUNDWATER SEEPAGE

Natural ground water seepage was not encountered in any of the test pits and there is no indication of temporary perched water tables in the soil profile, not even at the contact between soil and bedrock. It is therefore expected that if temporary perched water was to occur at all at the sites that this would occur at bedrock level and only after unusually prolonged and substantial rain. Groundwater seepage is not expected to be problematic at shallow depths on this site.

### 12.4. SOIL SITE CLASSIFICATION

A review of the test pit data indicates that the site is generally underlain by highly weathered granite bedrock. The laboratory tests indicated that material underlying the site exhibits high to very high potential expansiveness. The development potential has been broadly classified in terms of a Geotechnical Sub-Area based on field observations/investigation (geological, hydrogeological, and geomorphological), and laboratory soil testing of soil samples. According to AASHTO the soil samples were classified as A-7-6(8) the foundation design options as per SANS10400 H- NHBRC soil symbol is “**S1/H2**”. The recommended Foundation types in accordance with SANS 10400H- soil raft/Stiffed or cellular raft/ Piled or split Construction

## 13. CONCLUSION AND RECOMMENDATIONS

This report documents the findings of a near surface geotechnical investigation at the remainder of Portion 1 of the farm Naturelle Loksasie 272 LS in Tshikota Village. The investigation was carried out by means of test pitting, Dynamic Cone Penetrometer and laboratory testing of collected samples. Based on the field investigation and laboratory testing the following conclusions can be drawn:

The site is considered suitable for the proposed development from a geotechnical perspective provided the recommendations given in this report are adhered to.

All rainwater should be channeled away from the structures (Adequate drainage should be implemented). Earthworks and opening of foundations excavations should be carried out by a competent person. Laboratory testing of the collected samples indicate that the underlying soil exhibits high heave potential. During the construction phase, it is highly recommended that qualified personnel should regularly inspect and monitor, to track and record deviations in the actual foundation conditions from those predicted as reported in this geotechnical site investigation report.

## 14. FOUNDATION RECOMMENDATIONS

Variable consistencies encountered in the topsoil as well as the underlying reworked residual soils and residual soils comprising the soil profiles at the site present conditions that can result in differential movement of foundations,

attributable to the normal settlement due to consolidation of the sandy clay soils. The total movement due to consolidation and/or collapse of the wetted loose soil layers is anticipated to be in excess 0.1m with probable differential movement of at least 50% of this value. It is obvious that if no precautions to deal with this problem effectively are implemented, structural crack damage to masonry structures of a moderate to severe nature is to be expected. Crack damage to paving can also be expected and removing loose materials and replacing and compacting them in layers beneath the paved areas required at the proposed site and around it must be considered. In order to reduce consolidation and/or collapse settlement to tolerable levels, the following are recommended.

#### 14.1. PRECAUTIONS AGAINST EXPANSIVE SOILS SETTLEMENT

The most effective solution to deal with the loose to medium dense sandy clay is to remove portions of it from beneath a structure and replace it with dense inert compacted material. In the case of this site, the material removed from the excavation is likely to be suitable for re-compaction. Imported inert materials should be placed in the excavations in layers not exceeding 0.15m in thickness and compacted to specifications given below. We recommend that the following be done for single and double storey masonry structures that exert no more than 50 kPa founding pressure.

- Excavate to a minimum of 0,7 m depth to remove all the existing loose to medium dense sandy gravel, over the entire footprint of the structure and the access roads and parking areas, plus 1,5 m wider all round and replace it with material of the following specification. The majority of the removed material is likely to be suitable for re-compaction but should be tested to ensure that it meets the required standards prior to placing it back into the excavations.
- Compact the floor of the excavation to a depth of at least 0,15m to a density of 93% Modified AASHTO density.
- Next, backfill with imported material as specified below:
  - Minimum Grading Modulus: 1,2
  - Maximum Plasticity Index: 10%
  - Compacted layer thickness: 100 mm
  - Compaction standard: 95% of Modified AASHTO density
  - Compaction moisture 1 % variation either side of optimum
- Continue backfilling and compacting in layers as described above until the level of the standard strip or pad concrete foundations or building platform is reached.

Thereafter Modified normal shallow foundations may be used, with maximum bearing pressures limited to 50 kPa.

Manggeo Enviro Services recommend mechanical compaction over compaction with hand tools, because experience has shown that obtaining even compaction to the required densities is very difficult with hand tools and generally produces a less uniform and inferior result to mechanical compaction.

## **14.2. FOUNDATIONS FOR MODERATELY HEAVY STRUCTURES**

In the case where founding pressures will be greater than 50 kPa and up to about 150 kPa, we recommend that the over excavations for the trenches for the strip and pad footings be increased to a minimum of 1,2 m below the building platform level and that these be treated and backfilled with imported compacted materials as specified above.

Obviously, if part or all of the uppermost loose sand is left in place beneath the floors of structures, differential movement of the floors of buildings and between portions of floor slabs can take place. Movement joints between floor slabs and between floor slabs and walls, as well as between perimeter walls and internal walls founded on floor slabs, as appropriate to the structure, will need to be implemented. In addition, extensive incorporation of brick-force in all walls with wall ties at joints (the latter sealed with a durable flexible sealer and not a rigid medium like plaster) should be implemented where potentially compressible soil will cause differential movement of floors and foundations.

## **14.3. CONCRETE RAFT FOUNDATIONS PLACED WITHIN THE LOOSE SOIL PROFILE**

If such a foundation is implemented, the following items must receive careful attention.

- The raft must be of high rigidity and capable of supporting the superstructure without undue deflection in a situation where 0.01 m of settlement may occur at the center of the structure and none at the perimeter.
- The floor slab should be integral with the foundation itself so as to avoid differential movement between floors and walls.
- Flexibility of buried cables, water and sewer connections should be ensured.

The medium dense consistency soil is expected to soften on wetting up and we would advise caution in terms of founding pressures and recommend that 50 kPa not be exceeded.

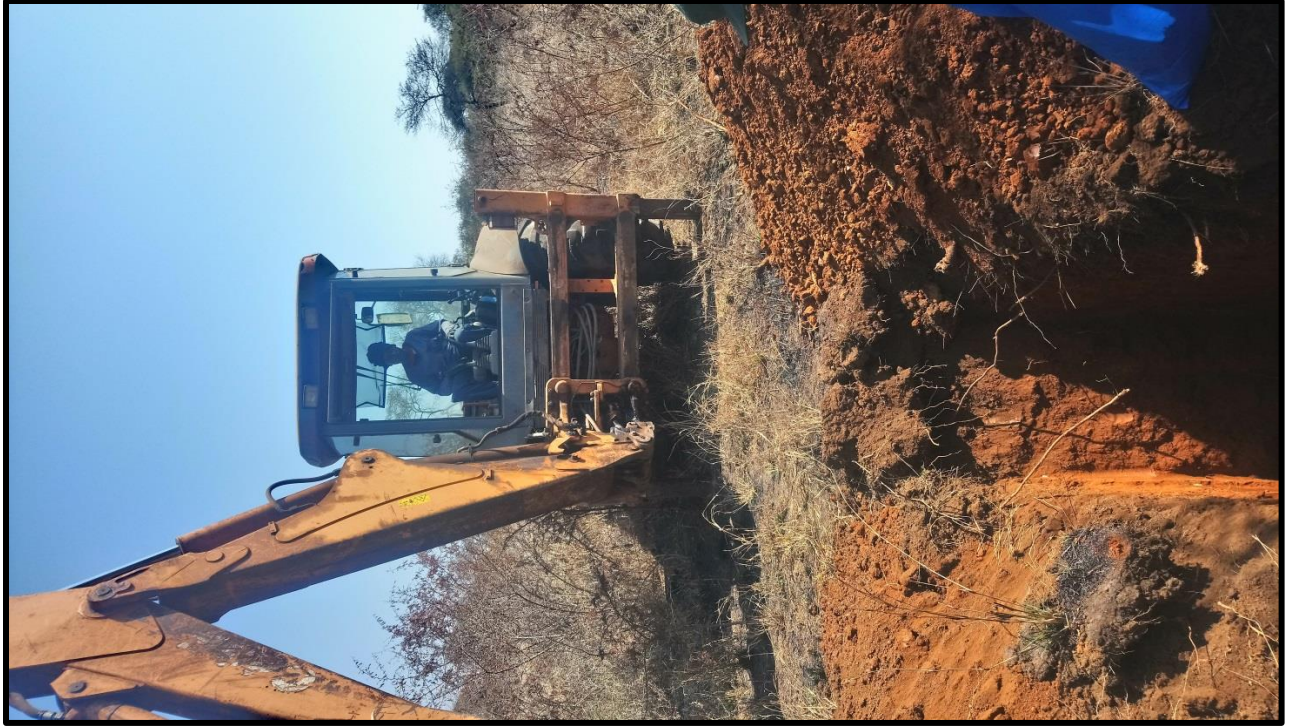
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- Van der westhuizen, W.A., de Bruijn, H. and Meintjies, P.G. (2006). The ventersdorp Supergroup in The Geology of South Africa, Published jointly by the Geological Society of South Africa and The council for Geoscience in 2006 Pretoria, 691pp.
- NP Richards and L Croukamp (2004). Geotechnical Investigation Guidelines for Cemetery Site Selection. Council for Geoscience

## 16.APPENDIX A: TEST PIT PROFILE & PHOTOS











## 17.APPENDIX B: LABORATORY TEST RESULTS

**Client** : MANG GEOENVIRO SERVICE (PTY) LTD  
**Address** : UNIT 2, BLOCK 9  
 : BOARDWALK OFFICE PARK  
 : 6 EROS ROAD

**Client Reference** :  
**Order No.** : Mavhetha

**Attention** :  
**Facsimile** :  
**E-mail** : fnmathebula@gmail.com; mahlogonolomagoi

**Date Received** : 17/08/2021  
**Date Tested** : 18/08/2021-08/09/2021  
**Date Reported** : 13/09/2021

**Project** : Tshikota EXT 3 Township Establishment  
**Project No.** : 2021-B-1037

**Report Status** : Final  
**Page** : 1 of 13

Herewith please find the test report(s) pertaining to the above project. All tests were conducted in accordance with prescribed test method(s). Information herein consists of the following:

Test(s) conducted / Item(s) measured	Qty.	Test Method(s)	Authorized By**	Page(s)
Atterberg Limits <0.425mm	13,000	SANS 3001 GR10	S Pullen	2-8; 11-12
Sieve Analysis 0.075mm	13,000	SANS 3001 GR1	S Pullen/ B Mvubu	2-8; 11-12
Hydrometer Analysis	13,000	SANS 3001 GR3	S Pullen/ B Mvubu	2-8
MDD & OMC	2,000	SANS 3001 GR30	S Pullen	9-10
California Bearing Ratio (CBR)	2,000	SANS 3001 GR40	S Pullen	11-12
pH of Soil *	2,000	TMH1 A20	S Pullen	13
Conductivity of saturated soil paste *	2,000	TMH1 A21T	S Pullen	13
Relative Density (Specific Gravity)	2,000	SANS 3001 AG23	S Pullen	3; 5

Any test results contained in this report and marked with \* in the table above are "not SANAS accredited" and are not included in the schedule of accreditation for this laboratory.

Any information contained in this test report pertain only to the areas and/or samples tested. Documents may only be reproduced or published in their full context.

While every care is taken to ensure that all tests are carried out in accordance with recognised standards, neither Civilab (Proprietary) Limited nor its employess shall be liable in any way whatsoever for any error made in the execution or reporting of tests or any erroneous conclusions drawn therefrom or for any consequences thereof.

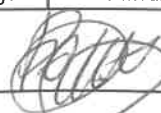
All interpretations, Interpolations, Opinions and/or Classifications contained in this report falls outside our scope of accreditation.

The following parameters, where applicable, were excluded from the classification procedure: Chemical modifications, Additional fines, Fractured Faces, Soluble Salts, pH, Conductivity, Coarse Sand Ratio, Durability (COLTO: G4-G9).

The following parameters, where applicable, were assumed: Rock types were assumed to be of an Arenaceous nature with Siliceous cementing material.

Unless otherwise requested or stated, all samples will be discarded after a period of 3 months.

Deviations in Test Methods:

Technical Signatory:	B Mvubu
Signature:	

\*\*All results are authorized electronically by approved managers and/or technical signatories.

<b>Client</b> :	MANG GEOENVIRO SERVICE (PTY) LTD	<b>Client Reference</b> :	
<b>Address</b> :	UNIT 2, BLOCK 9	<b>Order No.</b> :	Mavhetha
	BOARDWALK OFFICE PARK		
	6 EROS ROAD		
<b>Attention</b> :		<b>Date Received</b> :	17/08/2021
<b>Facsimile</b> :		<b>Date Tested</b> :	18/08/2021-08/09/2021
<b>E-mail</b> :	fnmathebula@gmail.com; mahlogonolomagor	<b>Date Reported</b> :	17/09/2021
<b>Project</b> :	Tshikota EXT 3 Township Establishment	<b>Report Status</b> :	Final
<b>Project No.</b> :	2021-B-1037	<b>Page</b> :	1 of 13

Herewith please find the test report(s) pertaining to the above project. All tests were conducted in accordance with prescribed test method(s). Information herein consists of the following:

Test(s) conducted / Item(s) measured	Qty.	Test Method(s)	Authorized By**	Page(s)
Atterberg Limits <0.425mm	13,000	SANS 3001 GR10	S Pullen	2-8; 11-12
Sieve Analysis 0.075mm	13,000	SANS 3001 GR1	S Pullen/ B Mvubu	2-8; 11-12
Hydrometer Analysis	13,000	SANS 3001 GR3	S Pullen/ B Mvubu	2-8
MDD & OMC	2,000	SANS 3001 GR30	S Pullen	9-10
California Bearing Ratio (CBR)	2,000	SANS 3001 GR40	S Pullen	11-12
pH of Soil *	2,000	TMH1 A20	S Pullen	13
Conductivity of saturated soil paste *	2,000	TMH1 A21T	S Pullen	13
Relative Density (Specific Gravity)	2,000	SANS 3001 AG23	S Pullen	3; 5

Any test results contained in this report and marked with \* in the table above are "not SANAS accredited" and are not included in the schedule of accreditation for this laboratory.

Any information contained in this test report pertain only to the areas and/or samples tested. Documents may only be reproduced or published in their full context.

While every care is taken to ensure that all tests are carried out in accordance with recognised standards, neither Civilab (Proprietary) Limited nor its employees shall be liable in any way whatsoever for any error made in the execution or reporting of tests or any erroneous conclusions drawn therefrom or for any consequences thereof.

All interpretations, Interpolations, Opinions and/or Classifications contained in this report falls outside our scope of accreditation.

The following parameters, where applicable, were excluded from the classification procedure: Chemical modifications, Additional fines, Fractured Faces, Soluble Salts, pH, Conductivity, Coarse Sand Ratio, Durability (COLTO: G4-G9).

The following parameters, where applicable, were assumed: Rock types were assumed to be of an Arenaceous nature with Siliceous cementing material.

Unless otherwise requested or stated, all samples will be discarded after a period of 3 months.

Deviations in Test Methods:

Technical Signatory:	B Mvubu
Signature:	

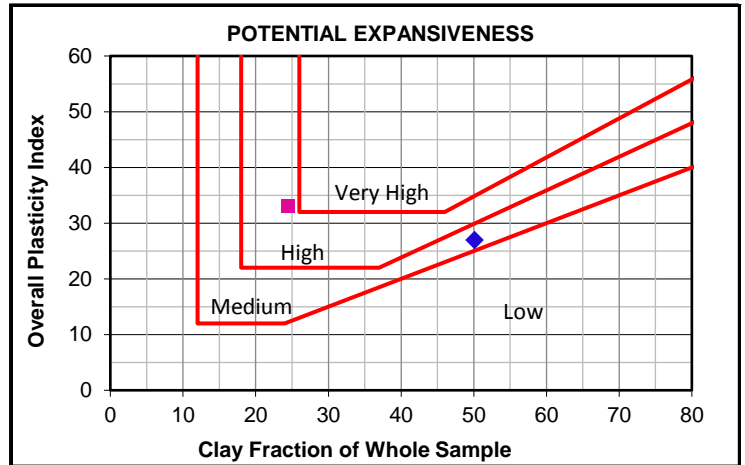
\*\*All results are authorized electronically by approved managers and/or technical signatories.

Client : MANG GEOENVIRO SERVICE (PTY) LTD  
 Project : Tshikota EXT 3 Township Establishment  
 Project No : 2021-B-1037

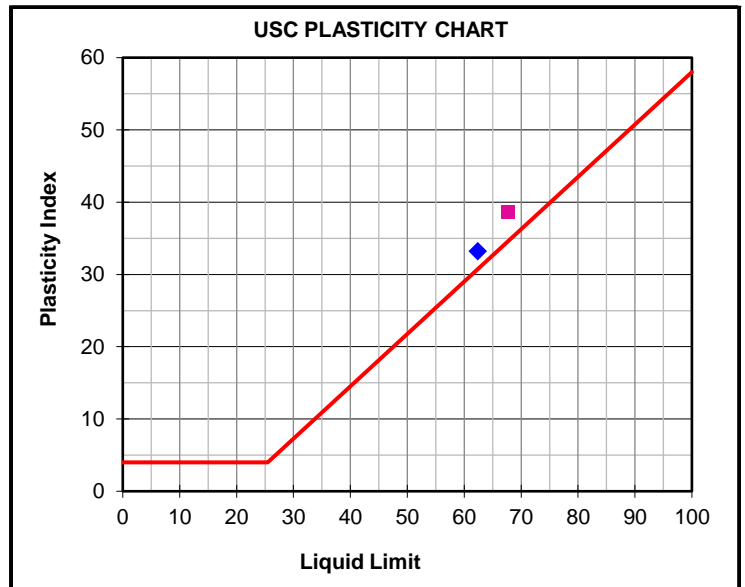
Date Received: 17/08/2021  
 Date Reported: 17/09/2021  
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## FOUNDATION INDICATOR

Laboratory Number	S-4121 ◆	S-4122 ■
Field Number	TP 1	TP 2
Client Reference		
Depth (m)	0.8-1.35	1-2.6
Position		
Coordinates	X Y	
Description		
Additional Information		
Calcrete / Crushed Stabilizing Agent		



<b>Moisture Content &amp; Relative Density</b>		
Moisture Content (%)		
Relative Density (S.G.)		



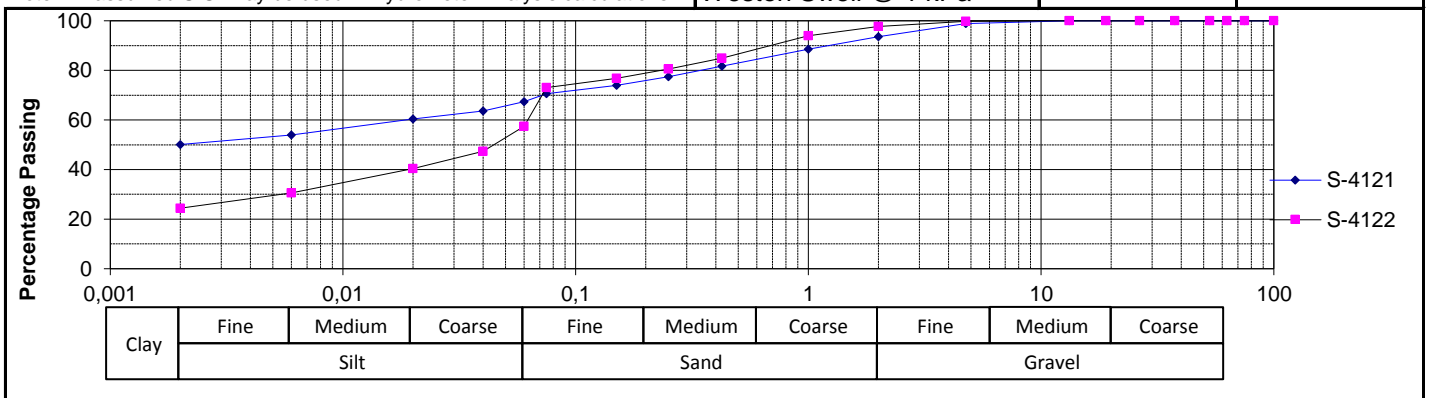
<b>Sieve Analysis (Wet Prep)</b>			
Percentage Passing	100 mm	100	100
	75 mm	100	100
	63 mm	100	100
	50 mm	100	100
	37.5 mm	100	100
	28 mm	100	100
	20 mm	100	100
	14 mm	100	100
	5 mm	99	100
	2 mm	94	98
	1 mm	89	94
	0.425 mm	82	85
	0.250 mm	77	80
	0.150 mm	74	77
0.075 mm	71	73	
Grading Modulus	0,54	0,44	

Laboratory Number	S-4121 ◆	S-4122 ■
<b>Atterberg Limits -425µ</b>		
Liquid Limit	% 62	68
Plasticity Index	% 33	39
Linear Shrinkage	% 16,0	17,0
Overall PI	% 27	33

<b>Hydrometer Analysis</b>			
Percentage Passing	0.060 mm	67	57
	0.040 mm	64	47
	0.020 mm	60	40
	0.006 mm	54	31
	0.002 mm	50	24
Gravel	% 6	2	
Sand	% 26	40	
Silt	% 17	33	
Clay	% 50	24	

<b>Classifications</b>		
HRB (AASHTO)	A-7-6(20)	A-7-6(20)
Unified (ASTM D2487)	CH	CH
Weston Swell @ 1 kPa		

Note: An assumed S.G. may be used in Hydrometer Analysis calculations

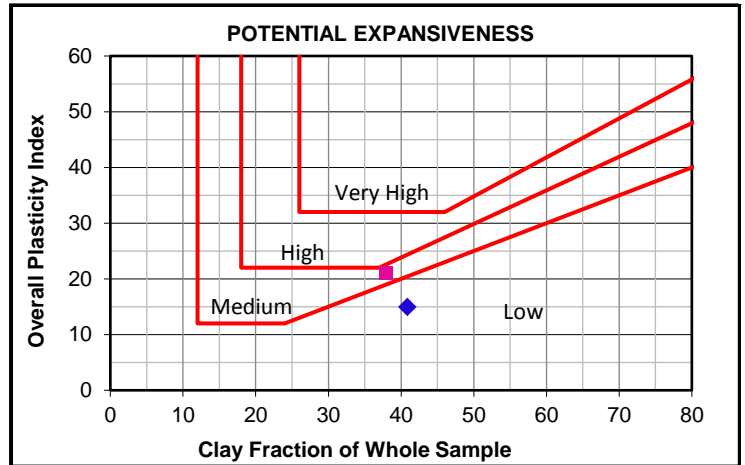


Client : MANG GEOENVIRO SERVICE (PTY) LTD  
 Project : Tshikota EXT 3 Township Establishment  
 Project No : 2021-B-1037

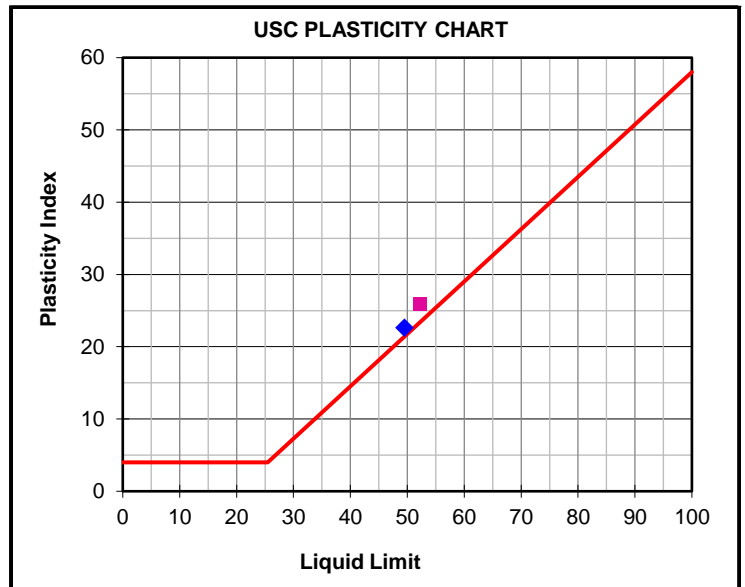
Date Received: 17/08/2021  
 Date Reported: 17/09/2021  
 Page No. : 3 of 13

## FOUNDATION INDICATOR

Laboratory Number	S-4123 ◆	S-4124 ■
Field Number	TP 3	TP 4
Client Reference		
Depth (m)	0.6-2.0	0.7-1.9
Position		
Coordinates	X Y	
Description		
Additional Information		
Calcrete / Crushed Stabilizing Agent		



<b>Moisture Content &amp; Relative Density</b>		
Moisture Content (%)		
Relative Density (S.G.)	2,778	



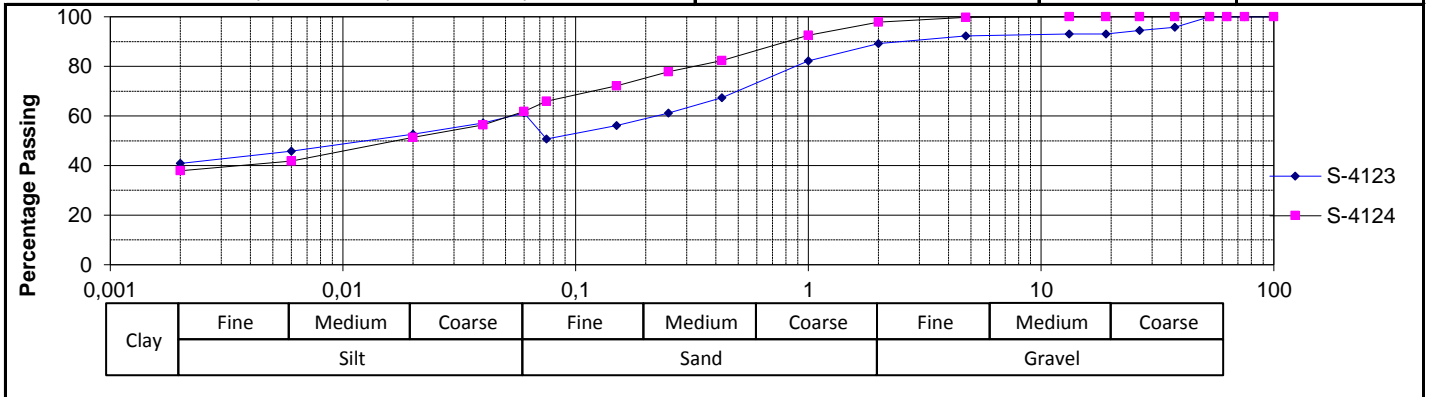
<b>Sieve Analysis (Wet Prep)</b>			
Percentage Passing	100 mm	100	100
	75 mm	100	100
	63 mm	100	100
	50 mm	100	100
	37.5 mm	96	100
	28 mm	94	100
	20 mm	93	100
	14 mm	93	100
	5 mm	92	100
	2 mm	89	98
	1 mm	82	93
	0.425 mm	67	82
	0.250 mm	61	78
	0.150 mm	56	72
0.075 mm	51	66	
Grading Modulus	0,93	0,54	

<b>Hydrometer Analysis</b>			
Percentage Passing	0.060 mm	61	62
	0.040 mm	57	56
	0.020 mm	53	51
	0.006 mm	46	42
	0.002 mm	41	38
Gravel	%	11	2
Sand	%	28	36
Silt	%	20	24
Clay	%	41	38

<b>Laboratory Number</b>		S-4123 ◆	S-4124 ■
<b>Atterberg Limits -425µ</b>			
Liquid Limit	%	50	52
Plasticity Index	%	23	26
Linear Shrinkage	%	10,0	12,0
Overall PI	%	15	21

<b>Classifications</b>		
HRB (AASHTO)	A-7-6(8)	A-7-6(16)
Unified (ASTM D2487)	CL	CH
Weston Swell @ 1 kPa		

Note: An assumed S.G. may be used in Hydrometer Analysis calculations



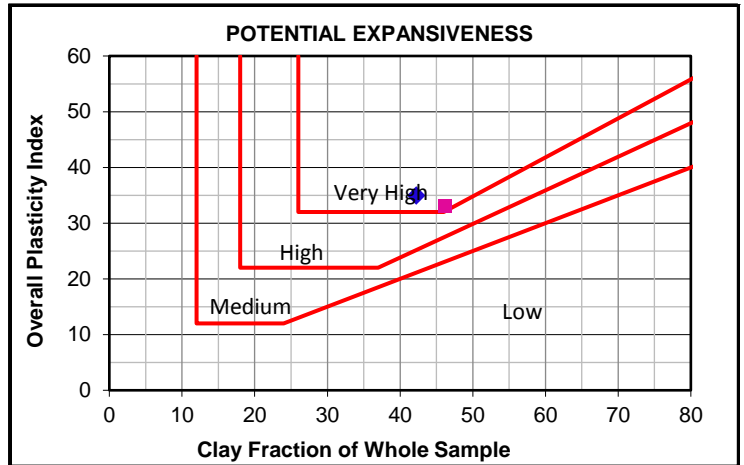


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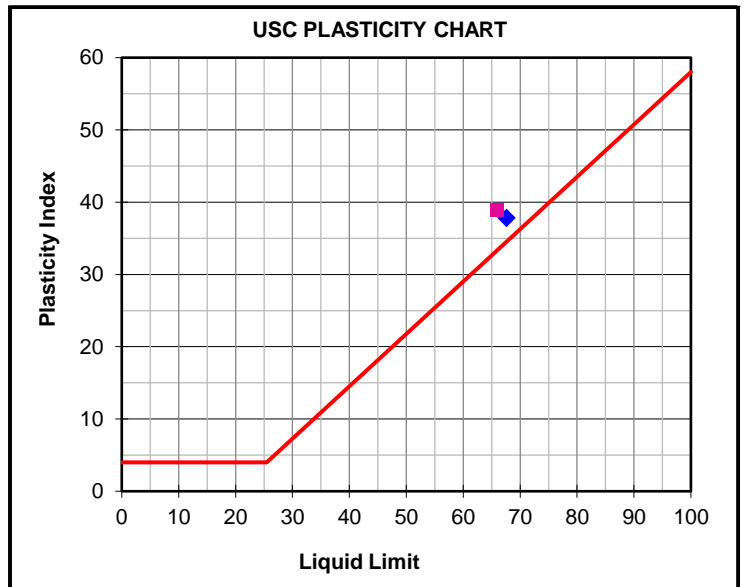
Date Received: 17/08/2021  
 Date Reported: 17/09/2021  
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## FOUNDATION INDICATOR

Laboratory Number	S-4125 ◆	S-4126 ■
Field Number	TP 5	TP 6
Client Reference		
Depth (m)	0.45-1.5	0.5-1.3
Position		
Coordinates	X Y	
Description		
Additional Information		
Calcrete / Crushed Stabilizing Agent		



<b>Moisture Content &amp; Relative Density</b>		
Moisture Content (%)		
Relative Density (S.G.)		



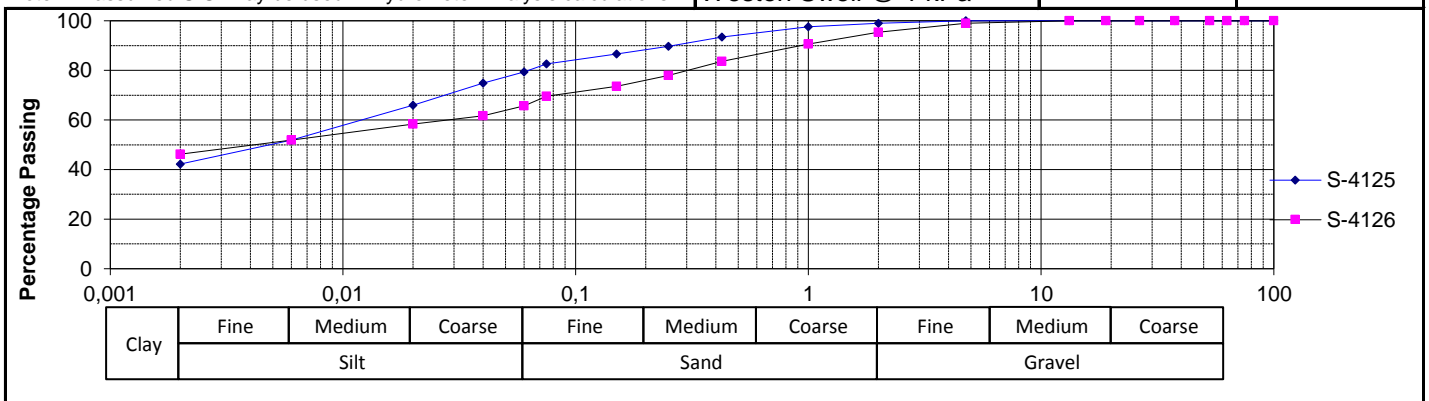
<b>Sieve Analysis (Wet Prep)</b>			
Percentage Passing	100 mm	100	100
	75 mm	100	100
	63 mm	100	100
	50 mm	100	100
	37.5 mm	100	100
	28 mm	100	100
	20 mm	100	100
	14 mm	100	100
	5 mm	100	99
	2 mm	99	95
	1 mm	98	91
	0.425 mm	93	84
	0.250 mm	90	78
	0.150 mm	87	74
0.075 mm	83	70	
Grading Modulus	0,25	0,51	

Laboratory Number	S-4125 ◆	S-4126 ■	
<b>Atterberg Limits -425µ</b>			
Liquid Limit	%	68	66
Plasticity Index	%	38	39
Linear Shrinkage	%	16,0	17,0
Overall PI	%	35	33

<b>Hydrometer Analysis</b>			
Percentage Passing	0.060 mm	79	66
	0.040 mm	75	62
	0.020 mm	66	58
	0.006 mm	52	52
	0.002 mm	42	46
Gravel	%	1	5
Sand	%	20	30
Silt	%	37	20
Clay	%	42	46

<b>Classifications</b>		
HRB (AASHTO)	A-7-6(20)	A-7-6(20)
Unified (ASTM D2487)	CH	CH
Weston Swell @ 1 kPa		

Note: An assumed S.G. may be used in Hydrometer Analysis calculations

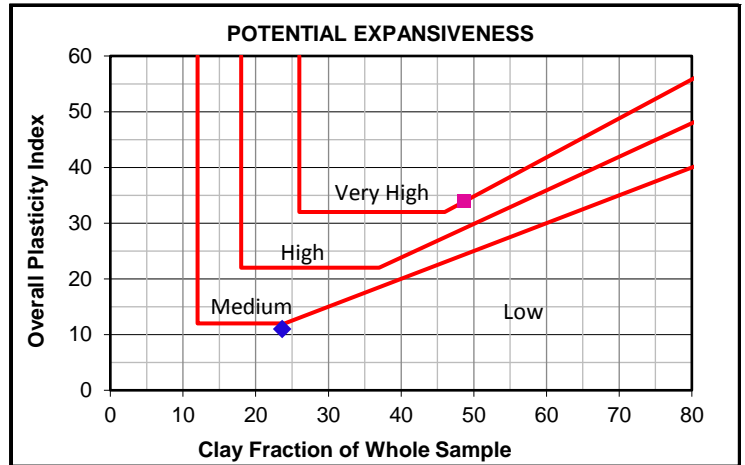


Client : MANG GEOENVIRO SERVICE (PTY) LTD  
 Project : Tshikota EXT 3 Township Establishment  
 Project No : 2021-B-1037

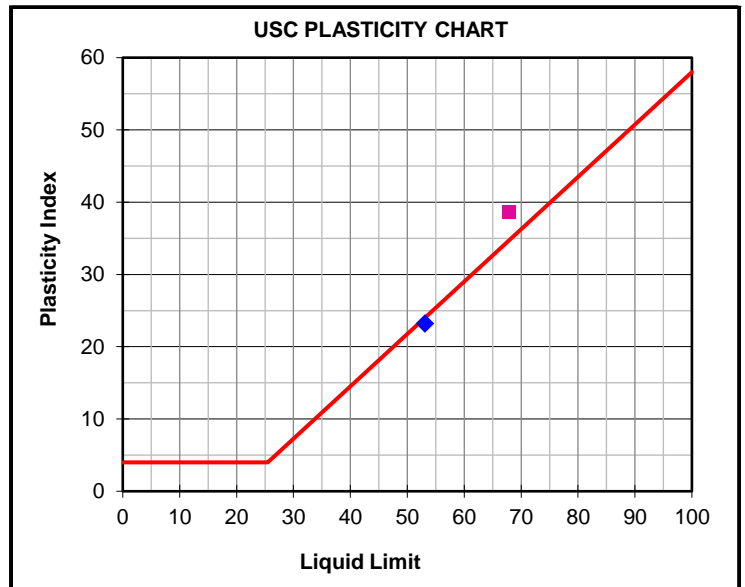
Date Received: 17/08/2021  
 Date Reported: 17/09/2021  
 Page No. : 5 of 13

## FOUNDATION INDICATOR

Laboratory Number	S-4127 ◆	S-4128 ■
Field Number	TP 7	TP 8
Client Reference		
Depth (m)	0.5-1.3	0.54-1.7
Position		
Coordinates	X Y	
Description		
Additional Information		
Calcrete / Crushed Stabilizing Agent		



<b>Moisture Content &amp; Relative Density</b>		
Moisture Content (%)		
Relative Density (S.G.)	2,812	



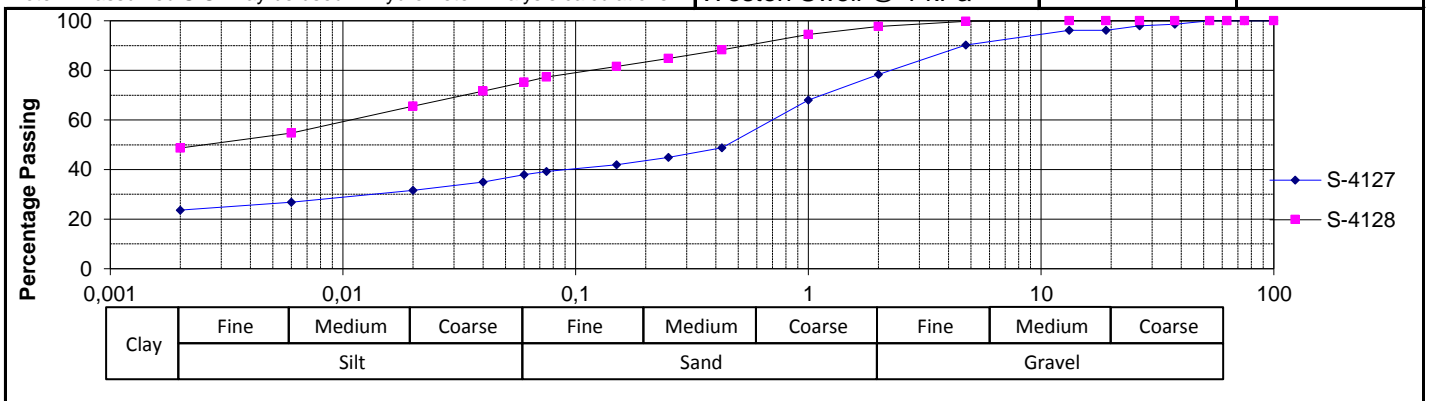
<b>Sieve Analysis (Wet Prep)</b>			
Percentage Passing	100 mm	100	100
	75 mm	100	100
	63 mm	100	100
	50 mm	100	100
	37.5 mm	99	100
	28 mm	98	100
	20 mm	96	100
	14 mm	96	100
	5 mm	90	100
	2 mm	78	98
	1 mm	68	95
	0.425 mm	49	88
	0.250 mm	45	85
	0.150 mm	42	82
0.075 mm	39	77	
Grading Modulus	1,34	0,37	

<b>Hydrometer Analysis</b>			
Percentage Passing	0.060 mm	38	75
	0.040 mm	35	72
	0.020 mm	32	66
	0.006 mm	27	55
	0.002 mm	24	49
Gravel	%	22	2
Sand	%	40	22
Silt	%	14	27
Clay	%	24	49

Laboratory Number	S-4127 ◆	S-4128 ■	
<b>Atterberg Limits -425µ</b>			
Liquid Limit	%	53	68
Plasticity Index	%	23	39
Linear Shrinkage	%	10,5	15,0
Overall PI	%	11	34

<b>Classifications</b>		
HRB (AASHTO)	A-7-6(4)	A-7-6(20)
Unified (ASTM D2487)	SM	CH
Weston Swell @ 1 kPa		

Note: An assumed S.G. may be used in Hydrometer Analysis calculations

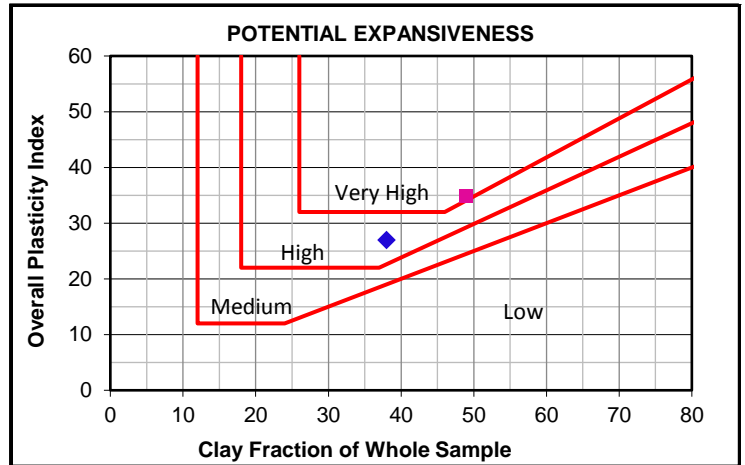


Client : MANG GEOENVIRO SERVICE (PTY) LTD  
 Project : Tshikota EXT 3 Township Establishment  
 Project No : 2021-B-1037

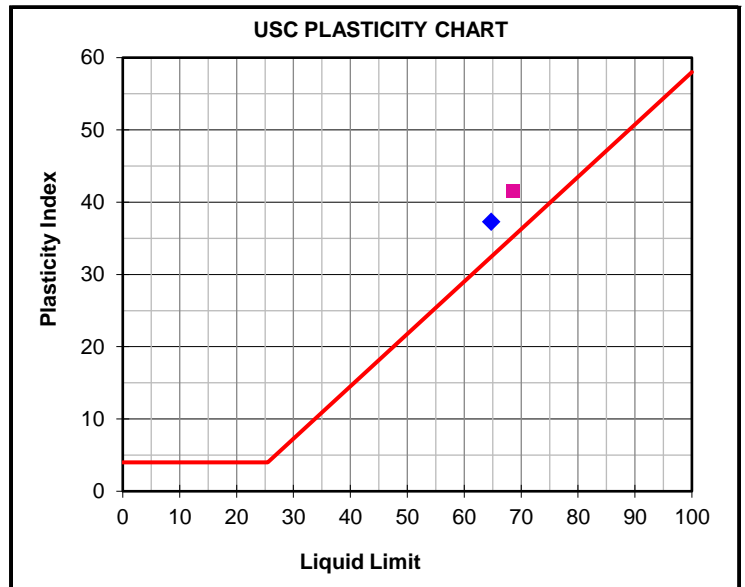
Date Received: 17/08/2021  
 Date Reported: 17/09/2021  
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## FOUNDATION INDICATOR

Laboratory Number	S-4129 ◆	S-4130 ■
Field Number	TP 9	TP 10
Client Reference		
Depth (m)	0.4-1.6	0.48-1.33
Position		
Coordinates	X Y	
Description		
Additional Information		
Calcrete / Crushed Stabilizing Agent		



<b>Moisture Content &amp; Relative Density</b>		
Moisture Content (%)		
Relative Density (S.G.)		



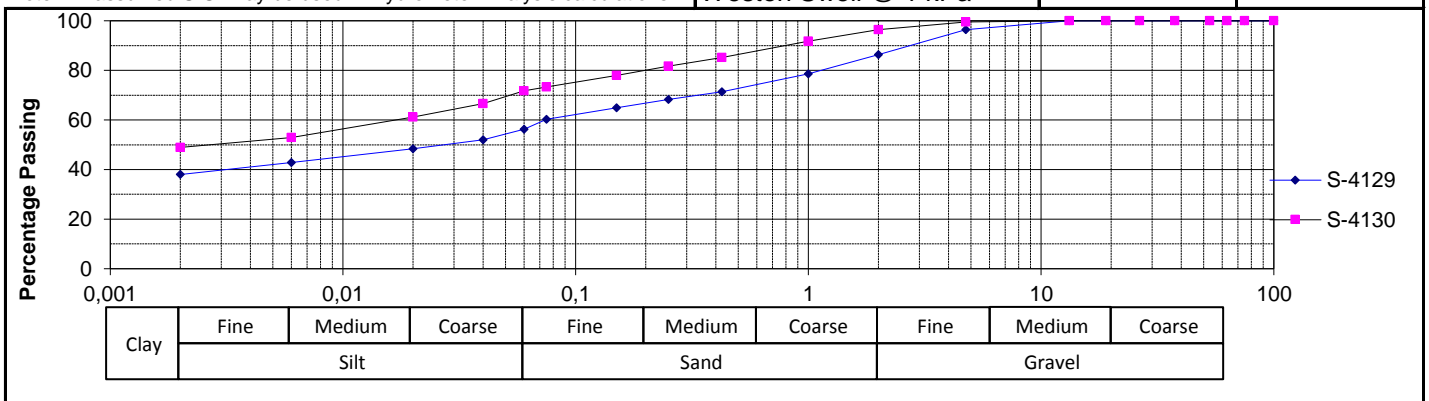
<b>Sieve Analysis (Wet Prep)</b>			
Percentage Passing	100 mm	100	100
	75 mm	100	100
	63 mm	100	100
	50 mm	100	100
	37.5 mm	100	100
	28 mm	100	100
	20 mm	100	100
	14 mm	100	100
	5 mm	96	100
	2 mm	86	96
	1 mm	79	92
	0.425 mm	71	85
	0.250 mm	68	82
0.150 mm	65	78	
0.075 mm	60	73	
Grading Modulus	0,82	0,45	

<b>Hydrometer Analysis</b>			
Percentage Passing	0.060 mm	56	72
	0.040 mm	52	67
	0.020 mm	48	61
	0.006 mm	43	53
	0.002 mm	38	49
Gravel	%	14	4
Sand	%	30	25
Silt	%	18	23
Clay	%	38	49

Laboratory Number	S-4129 ◆	S-4130 ■	
<b>Atterberg Limits -425µ</b>			
Liquid Limit	%	65	68
Plasticity Index	%	37	42
Linear Shrinkage	%	15,5	16,5
Overall PI	%	27	35

<b>Classifications</b>		
HRB (AASHTO)	A-7-6(20)	A-7-6(20)
Unified (ASTM D2487)	CH	CH
Weston Swell @ 1 kPa		

Note: An assumed S.G. may be used in Hydrometer Analysis calculations

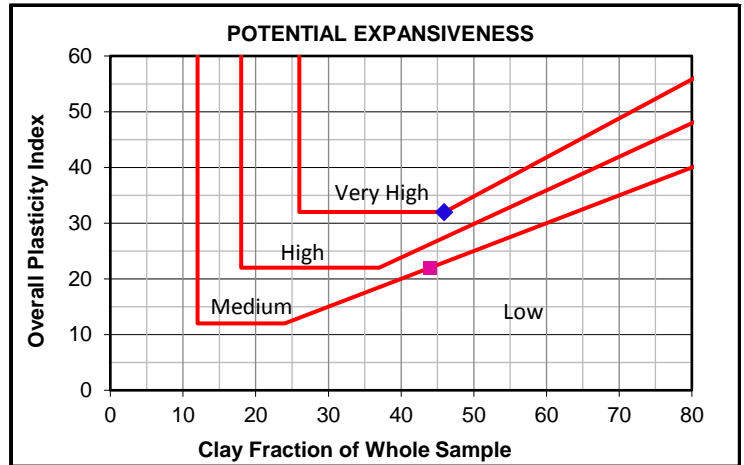


Client : MANG GEOENVIRO SERVICE (PTY) LTD  
 Project : Tshikota EXT 3 Township Establishment  
 Project No : 2021-B-1037

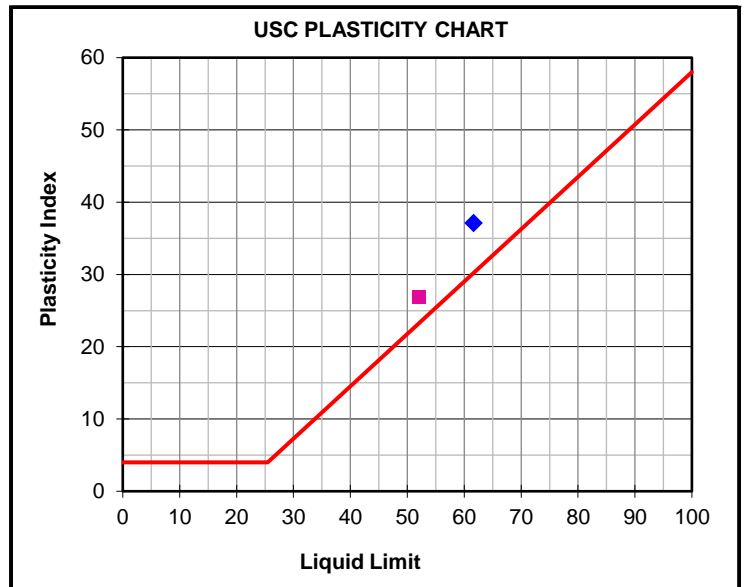
Date Received: 17/08/2021  
 Date Reported: 17/09/2021  
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## FOUNDATION INDICATOR

Laboratory Number	S-4131 ◆	S-4132 ■
Field Number	TP 11	TP 12
Client Reference		
Depth (m)	0.43-1.8	0.34-1.82
Position		
Coordinates	X Y	
Description		
Additional Information		
Calcrete / Crushed Stabilizing Agent		



<b>Moisture Content &amp; Relative Density</b>		
Moisture Content (%)		
Relative Density (S.G.)		



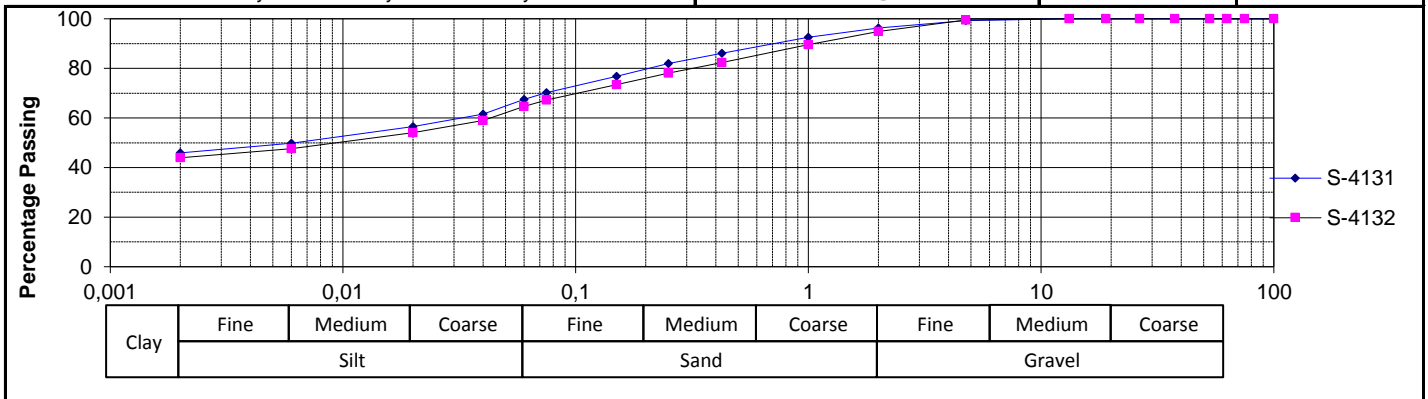
<b>Sieve Analysis (Wet Prep)</b>			
Percentage Passing	100 mm	100	100
	75 mm	100	100
	63 mm	100	100
	50 mm	100	100
	37.5 mm	100	100
	28 mm	100	100
	20 mm	100	100
	14 mm	100	100
	5 mm	99	100
	2 mm	96	95
	1 mm	93	90
	0.425 mm	86	82
	0.250 mm	82	78
0.150 mm	77	73	
0.075 mm	70	67	
Grading Modulus	0,48	0,56	

<b>Laboratory Number</b>		S-4131 ◆	S-4132 ■
<b>Atterberg Limits -425µ</b>			
Liquid Limit	%	62	52
Plasticity Index	%	37	27
Linear Shrinkage	%	15,5	12,0
Overall PI	%	32	22

<b>Hydrometer Analysis</b>			
Percentage Passing	0.060 mm	68	65
	0.040 mm	62	59
	0.020 mm	57	54
	0.006 mm	50	48
	0.002 mm	46	44
Gravel	%	4	5
Sand	%	29	30
Silt	%	22	21
Clay	%	46	44

<b>Classifications</b>		
HRB (AASHTO)	A-7-6(20)	A-7-6(17)
Unified (ASTM D2487)	CH	CH
Weston Swell @ 1 kPa		

Note: An assumed S.G. may be used in Hydrometer Analysis calculations

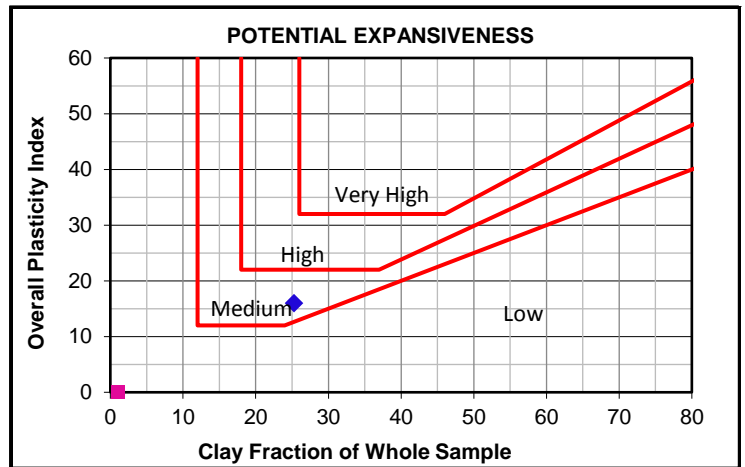


Client : MANG GEOENVIRO SERVICE (PTY) LTD  
 Project : Tshikota EXT 3 Township Establishment  
 Project No : 2021-B-1037

Date Received: 17/08/2021  
 Date Reported: 17/09/2021  
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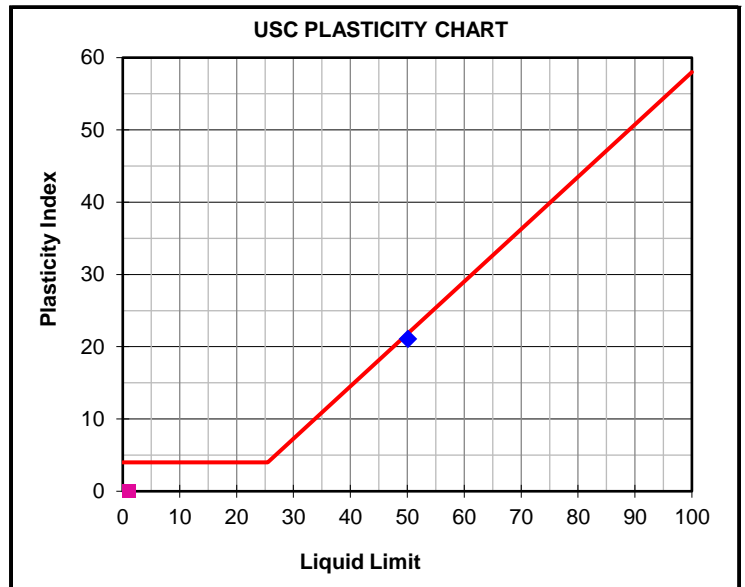
## FOUNDATION INDICATOR

Laboratory Number	S-4133	
Field Number	TP 13	
Client Reference		
Depth (m)	0.5-2.0	
Position		
Coordinates	X Y	
Description		
Additional Information		
Calcrete / Crushed Stabilizing Agent		



**Moisture Content & Relative Density**

Moisture Content (%)	
Relative Density (S.G.)	



**Sieve Analysis (Wet Prep)**

Percentage Passing	100 mm	100
	75 mm	100
	63 mm	100
	50 mm	100
	37.5 mm	100
	28 mm	100
	20 mm	100
	14 mm	99
	5 mm	98
	2 mm	92
	1 mm	86
	0.425 mm	77
	0.250 mm	74
	0.150 mm	68
	0.075 mm	63
Grading Modulus		0,68

Laboratory Number	S-4133
<b>Atterberg Limits -425µ</b>	
Liquid Limit	% 50
Plasticity Index	% 21
Linear Shrinkage	% 9,0
Overall PI	% 16

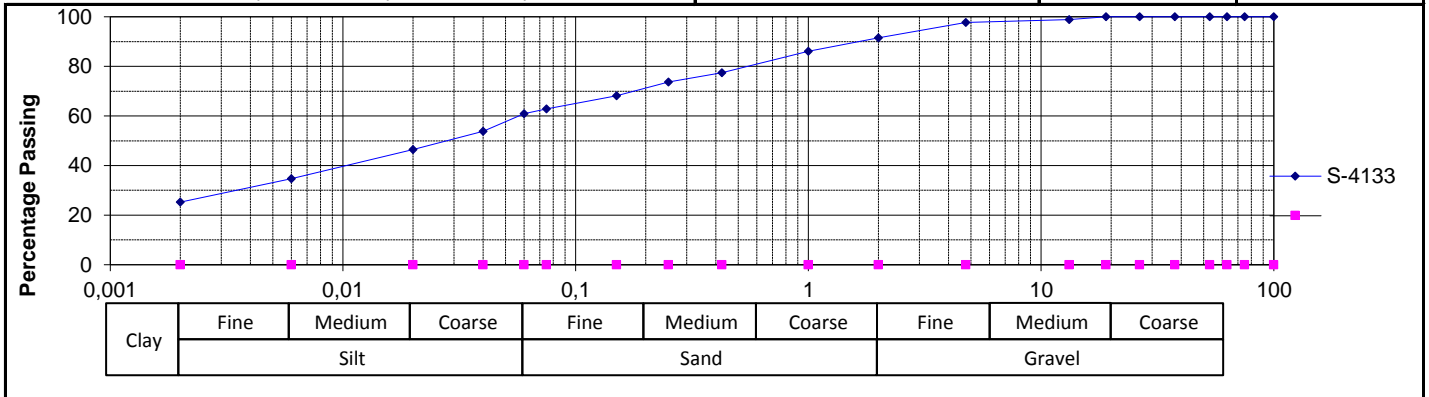
**Hydrometer Analysis**

Percentage Passing	0.060 mm	61
	0.040 mm	54
	0.020 mm	46
	0.006 mm	35
	0.002 mm	25
Gravel	%	8
Sand	%	31
Silt	%	36
Clay	%	25

**Classifications**

HRB (AASHTO)	A-7-6(12)
Unified (ASTM D2487)	MH
Weston Swell @ 1 kPa	

Note: An assumed S.G. may be used in Hydrometer Analysis calculations



Client : MANG GEOENVIRO SERVICE (PTY) LTD  
 Project : Tshikota EXT 3 Township Establishment  
 Project No: 2021-B-1037

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## MOISTURE DENSITY RELATIONSHIP

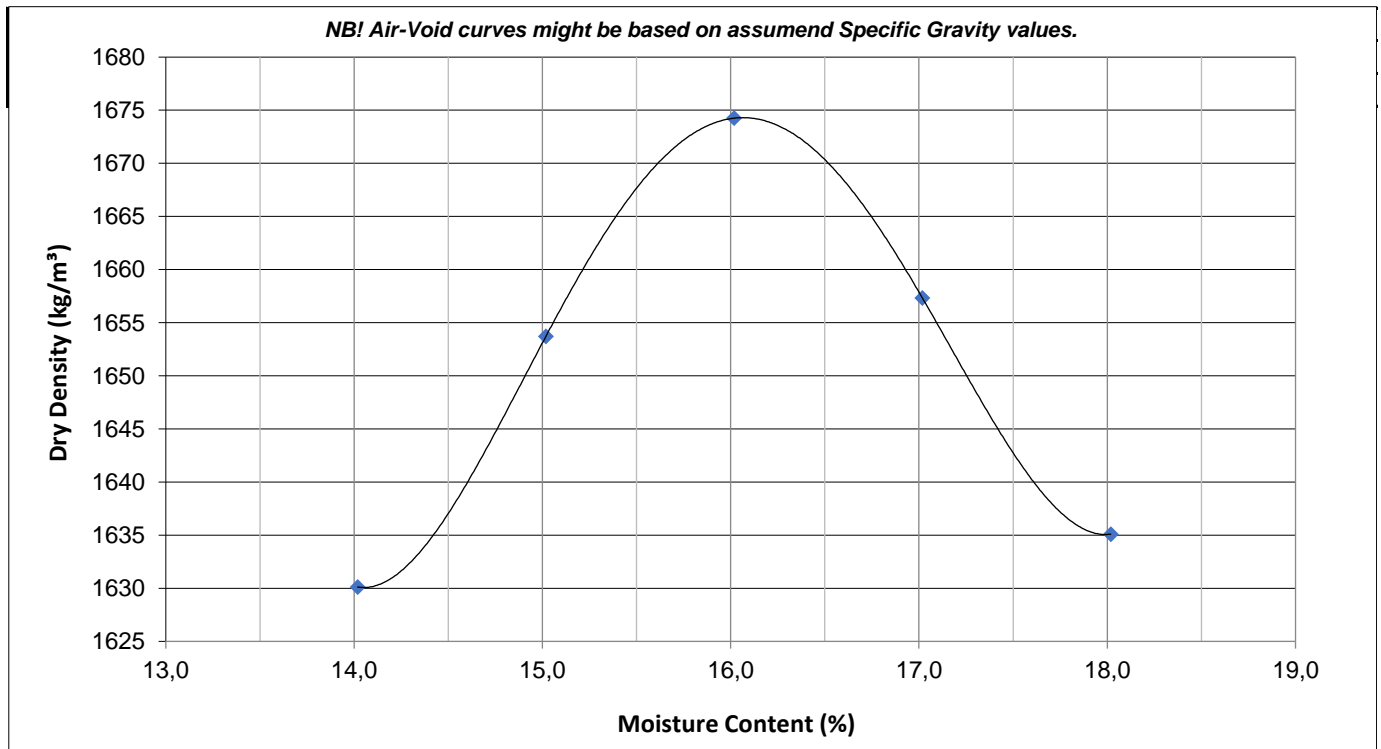
Laboratory Number	S-4123	
Field Number	TP3	
Client Reference		
Depth (m)	0,6-2,0	
Position		
Coordinates	X	
	Y	
Description		
Additional Information		
% of Sample Scalped		
Stabilizing Agent		

**Maximum Dry Density & Optimum Moisture Content - SANS 3001 GR30**

Compactive Effort:	Modified AASHTO
--------------------	-----------------

Dry Density	kg/m <sup>3</sup>	1674	1657	1654	1635	1630	
Moisture Content	%	16,0	17,0	15,0	18,0	14,0	

Max. Dry Density	kg/m <sup>3</sup>	1674
Optimum Moisture	%	16,1



Client : MANG GEOENVIRO SERVICE (PTY) LTD  
 Project : Tshikota EXT 3 Township Establishment  
 Project No: 2021-B-1037

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## MOISTURE DENSITY RELATIONSHIP

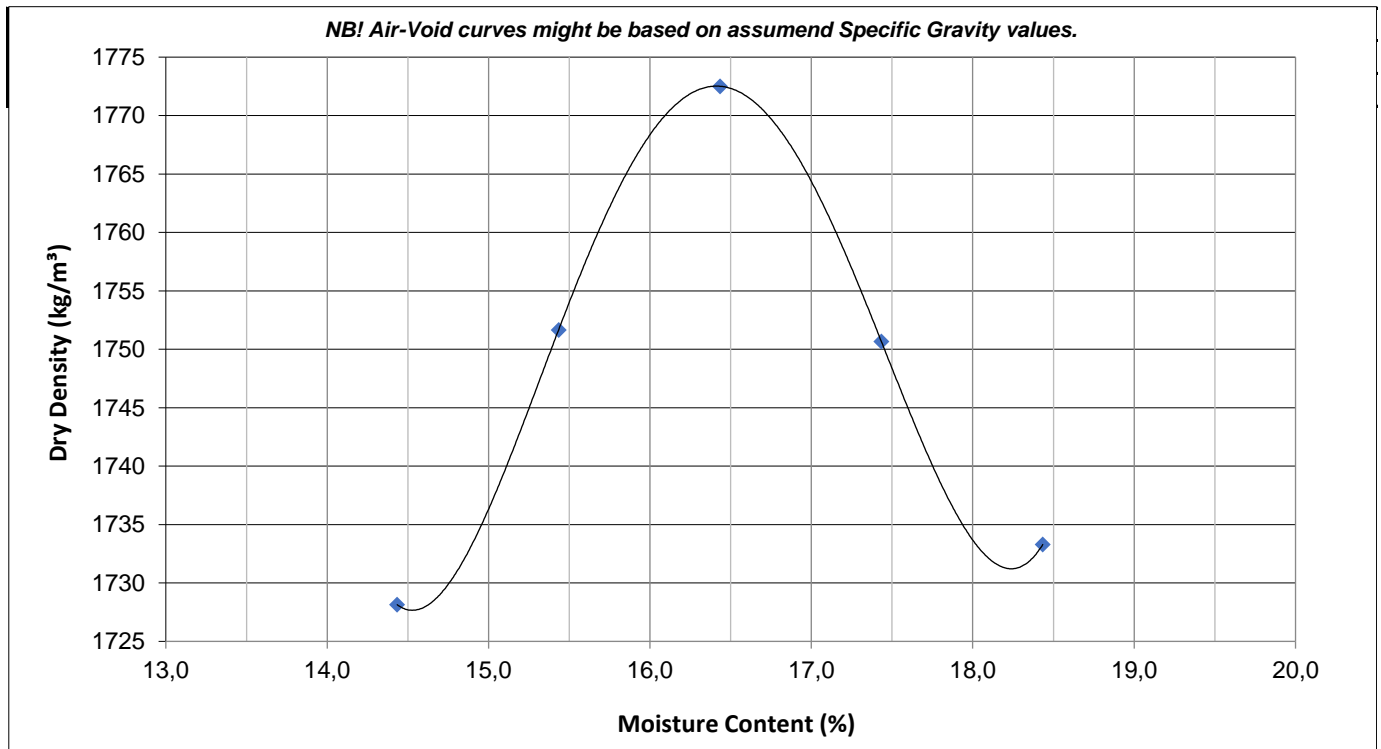
Laboratory Number	S-4127	
Field Number	TP7	
Client Reference		
Depth (m)	0,5-1,3	
Position		
Coordinates	X	
	Y	
Description		
Additional Information		
% of Sample Scalped		
Stabilizing Agent		

**Maximum Dry Density & Optimum Moisture Content - SANS 3001 GR30**

Compactive Effort:	Modified AASHTO
--------------------	-----------------

Dry Density	kg/m <sup>3</sup>	1773	1751	1733	1752	1728	
Moisture Content	%	16,4	17,4	18,4	15,4	14,4	

Max. Dry Density	kg/m <sup>3</sup>	1773
Optimum Moisture	%	16,4



Client : MANG GEOENVIRO SERVICE (PTY) LTD  
 Project : Tshikota EXT 3 Township Establishment  
 Project No. : 2021-B-1037

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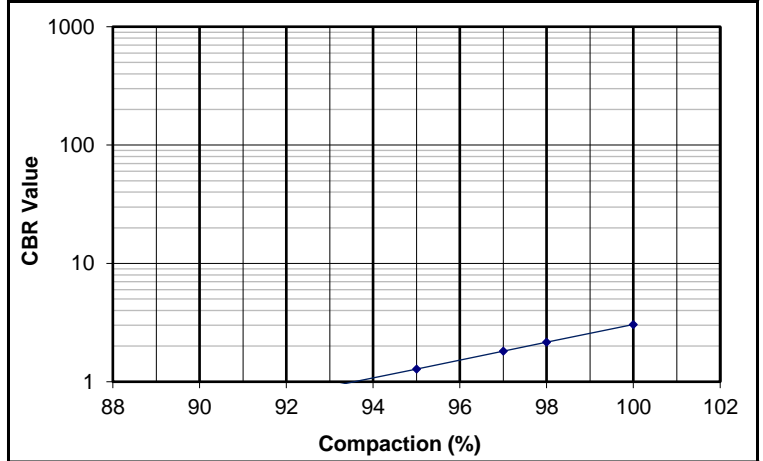
## CALIFORNIA BEARING RATIO (CBR) & ROAD INDICATOR REPORT

Laboratory No.	S-4123	
Field Number	TP3	
Client Reference		
Depth (m)	0,6-2,0	
Position		
Coordinates	X	
	Y	
Description		
Additional information		
Calcrete/Crushed		
Stabilizing Agent		

Laboratory No.	S-4123	
<b>Maximum Dry Density &amp; Optimum Moisture Content</b>		
MDD	kg/m <sup>3</sup>	1674
OMC	%	16,1

<b>California Bearing Ratio</b>					
<b>Compaction Data</b>					
Moisture	%	16,1			
Dry Density	kg/m <sup>3</sup>	1685	1597	1516	
Compaction	%	100,0	94,8	90,0	
<b>Penetration Data</b>					
CBR at	2.54 mm	3	2	1	
	5.08 mm	3	2	1	
	7.62 mm	3	2	1	
Swell	%	3,6	4,8	3,4	
Final Moisture (%)		24,9	25,6	30,61	

<b>Sieve Analysis (Wet preparation)</b>		
Percentage Passing	100 mm	100
	75 mm	100
	63 mm	100
	53 mm	100
	37,5 mm	96
	28 mm	94
	20 mm	93
	14 mm	93
	5 mm	92
	2 mm	89
	1 mm	82
	0.425 mm	67
	0.250 mm	61
	0.150 mm	56
0.075 mm	51	
Grading Modulus		0,93

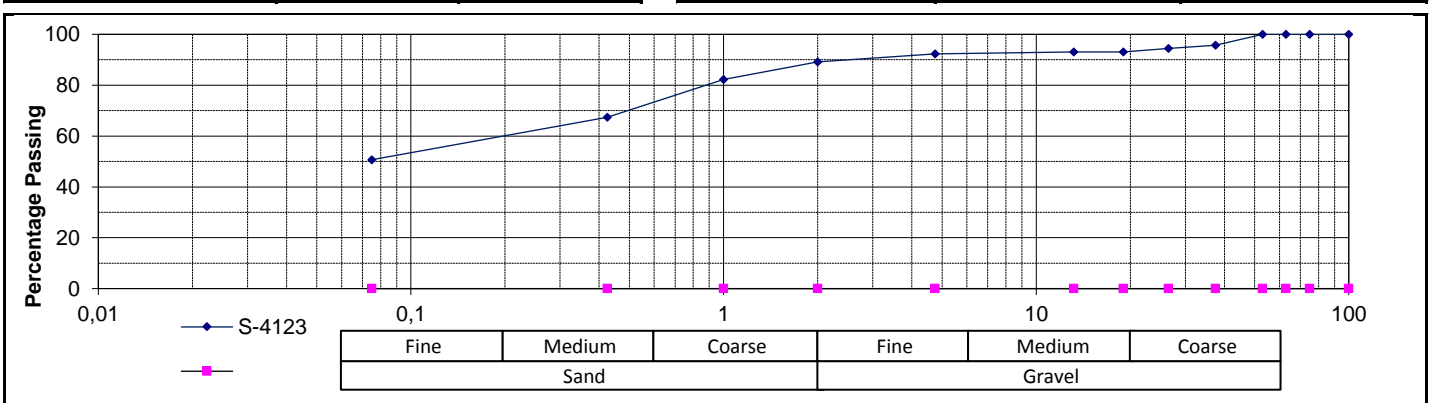


<b>Interpolated CBR Data</b>			
CBR	@ 100%	Mod. AASHTO	3
	@ 98%		2
	@ 97%		2
	@ 95%		1
	@ 93%		1
	@ 90%		1
	@ SANS3001 Midpoint		2

<b>Soil Mortar Analysis</b>		
Coarse Sand	24	
Coarse Fine Sand	7	
Medium Fine Sand	6	
Fine Fine Sand	6	
Silt and Clay	57	

<b>Classifications</b>		
HRB (AASHTO)	A-7-6(8)	
COLTO		
TRH14		

<b>Atterberg Limits</b>		
Liquid Limit (%)	50	
Plasticity Index (%)	23	
Linear Shrinkage (%)	10,0	





Client : MANG GEOENVIRO SERVICE (PTY) LTD  
 Project : Tshikota EXT 3 Township Establishment  
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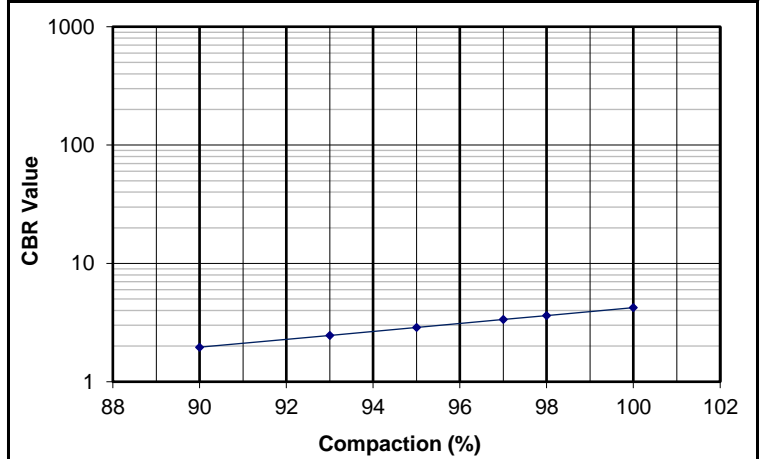
## CALIFORNIA BEARING RATIO (CBR) & ROAD INDICATOR REPORT

Laboratory No.	S-4127	
Field Number	TP7	
Client Reference		
Depth (m)	0,5-1,3	
Position		
Coordinates	X	
	Y	
Description		
Additional information		
Calcrete/Crushed		
Stabilizing Agent		

Laboratory No.	S-4127	
<b>Maximum Dry Density &amp; Optimum Moisture Content</b>		
MDD	kg/m <sup>3</sup>	1773
OMC	%	16,4

<b>California Bearing Ratio</b>				
Compaction Data				
Moisture	%	16,3		
Dry Density	kg/m <sup>3</sup>	1782	1695	1604
Compaction	%	100,0	95,1	90,0
Penetration Data				
CBR at	2.54 mm	5	2	2
	5.08 mm	6	2	2
	7.62 mm	6	2	2
Swell	%	1,8	2,3	2,9
Final Moisture (%)		21,8	23,09	24,32

<b>Sieve Analysis (Wet preparation)</b>		
Percentage Passing	100 mm	100
	75 mm	100
	63 mm	100
	53 mm	100
	37,5 mm	99
	28 mm	98
	20 mm	96
	14 mm	96
	5 mm	90
	2 mm	78
	1 mm	68
	0.425 mm	49
	0.250 mm	45
	0.150 mm	42
0.075 mm	39	
Grading Modulus	1,34	

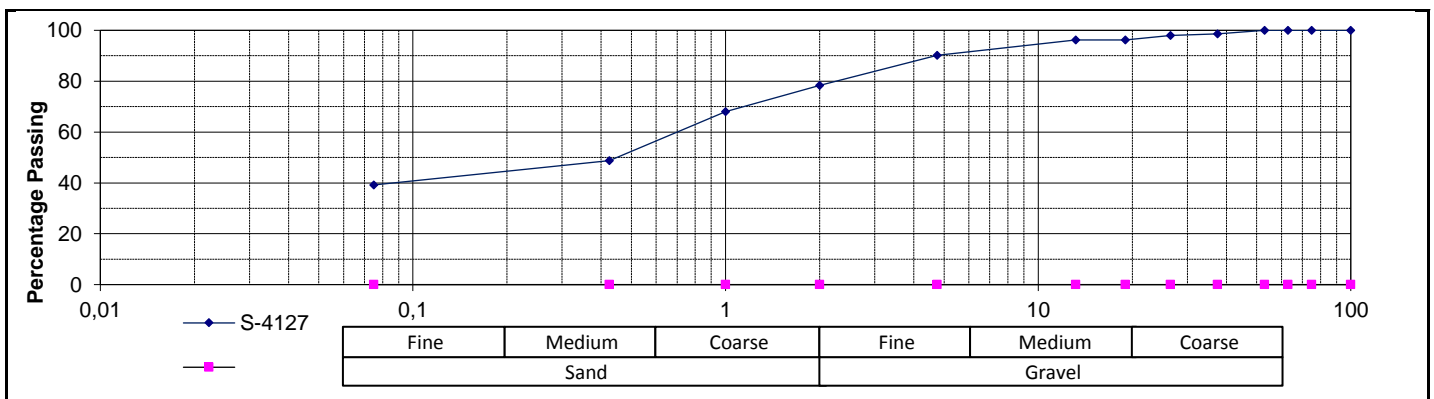


<b>Interpolated CBR Data</b>			
CBR	@ 100%	Mod. AASHTO	4
	@ 98%		4
	@ 97%		3
	@ 95%		3
	@ 93%		2
	@ 90%		2
	@ SANS3001 Midpoint		3

<b>Soil Mortar Analysis</b>		
Coarse Sand	38	
Coarse Fine Sand	5	
Medium Fine Sand	4	
Fine Fine Sand	3	
Silt and Clay	50	

<b>Classifications</b>		
HRB (AASHTO)	A-7-6(4)	
COLTO		
TRH14		

<b>Atterberg Limits</b>		
Liquid Limit (%)	53	
Plasticity Index (%)	23	
Linear Shrinkage (%)	10,5	



Client : MANG GEOENVIRO SERVICE (PTY) LTD  
 Project : Tshikota EXT 3 Township Establishment  
 Project No: 2021-B-1037

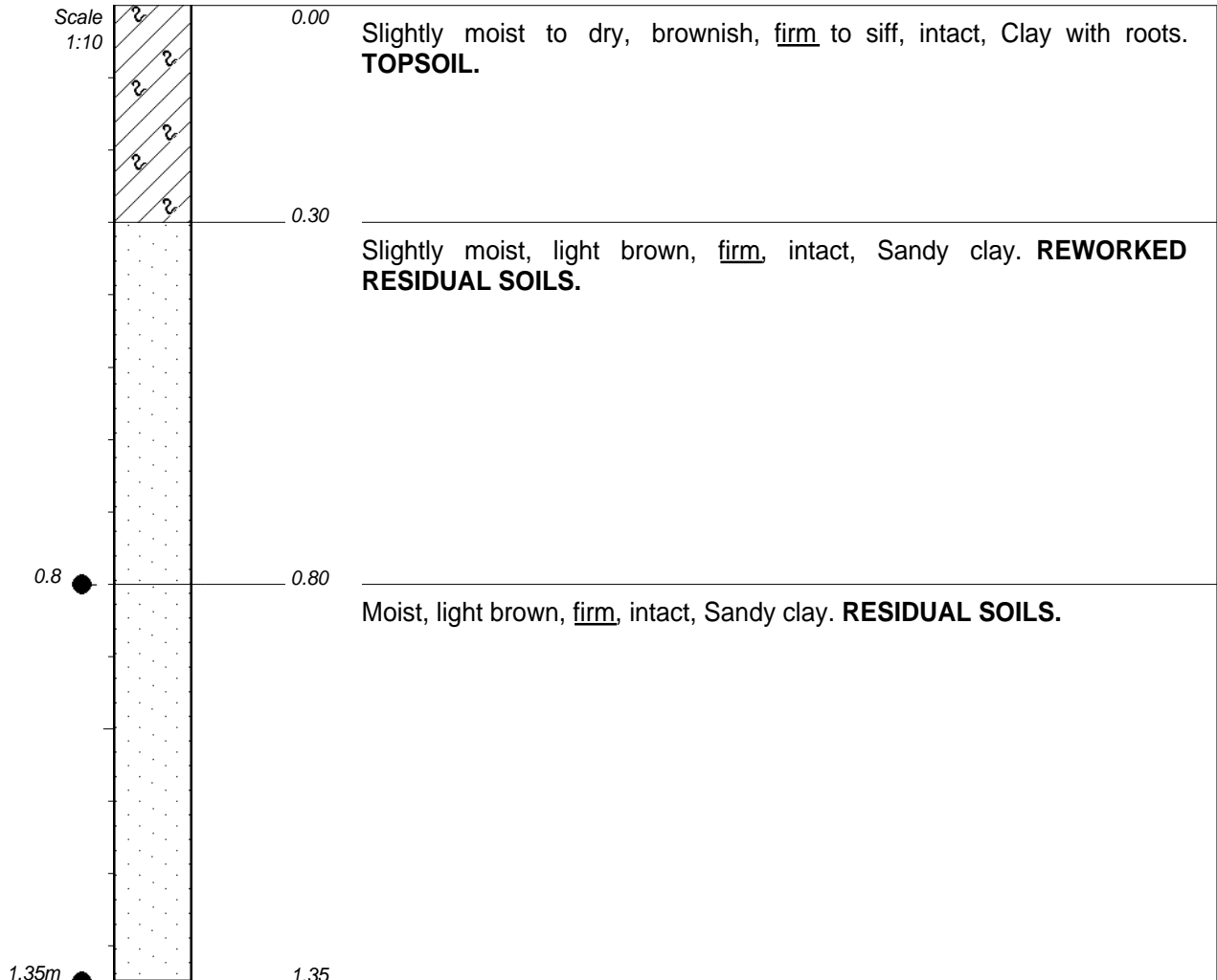
Date Received : 17/08/2021  
 Date Reported : 17/09/2021  
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## pH, CONDUCTIVITY, RESISTIVITY and ORGANIC IMPURITIES

Lab No	Field No	Depth (m)	Coordinates	Description / Additional Information	pH	Electrical Conductivity (S/m)	Electrical Resistivity (Ω/m) *	Organic Impurities
S-4123	TP3	0,6-2,0	X: Y:		6,7	0,038	26,316	
S-4127	TP7	0,5-1,3	X: Y:		6,2	0,016	62,500	
			X: Y:					
			X: Y:					
			X: Y:					
			X: Y:					
			X: Y:					
			X: Y:					
			X: Y:					
			X: Y:					
			X: Y:					
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			X: Y:					
			X: Y:					
			X: Y:					
			X: Y:					
			X: Y:					
			X: Y:					

Note : \* Electrical resistivity is calculated from the electrical conductivity

## 18.APPENDIX C: SOIL PROFILES



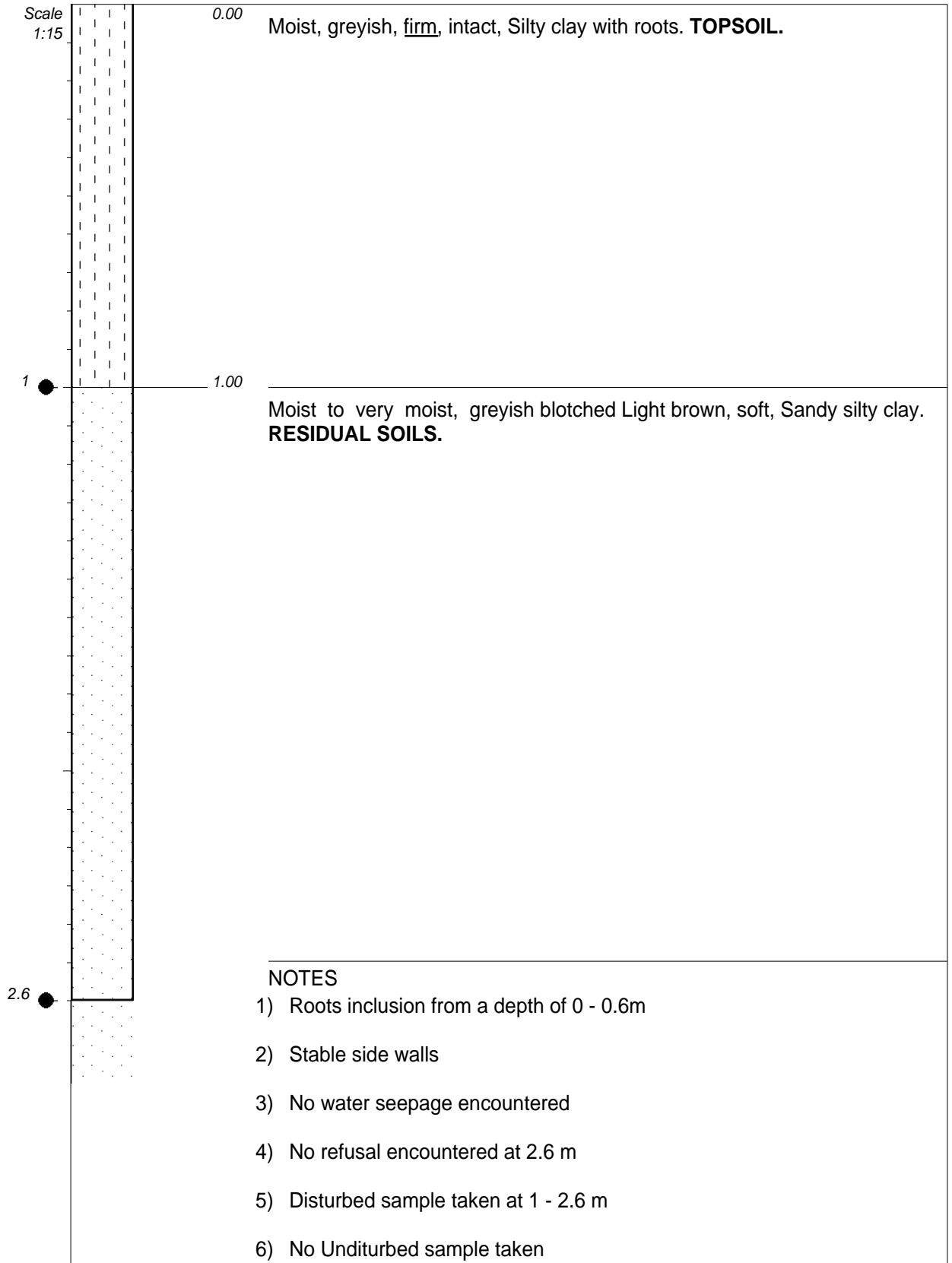
**NOTES**

- 1) Roots inclusion from a depth of 0 - 0.5m
- 2) Stable side walls
- 3) No water seepage encountered
- 4) Refusal encountered at 1.35 m
- 5) Disturbed sample taken at 0.8 - 1.35m
- 6) No Unditurbed sample taken

CONTRACTOR :  
 MACHINE : Tractor Loader Backhoe (TLB).  
 DRILLED BY :  
 PROFILED BY : Mavhetha Lavhelesani  
 TYPE SET BY : Mavhetha Lavhelesani  
 SETUP FILE : STANDARD.SET

INCLINATION :  
 DIAM : 0.7 m  
 DATE :  
 DATE : 12/08/2021  
 DATE : 28/09/2021 09:20  
 TEXT : ..00\Examples\Examples.TXT

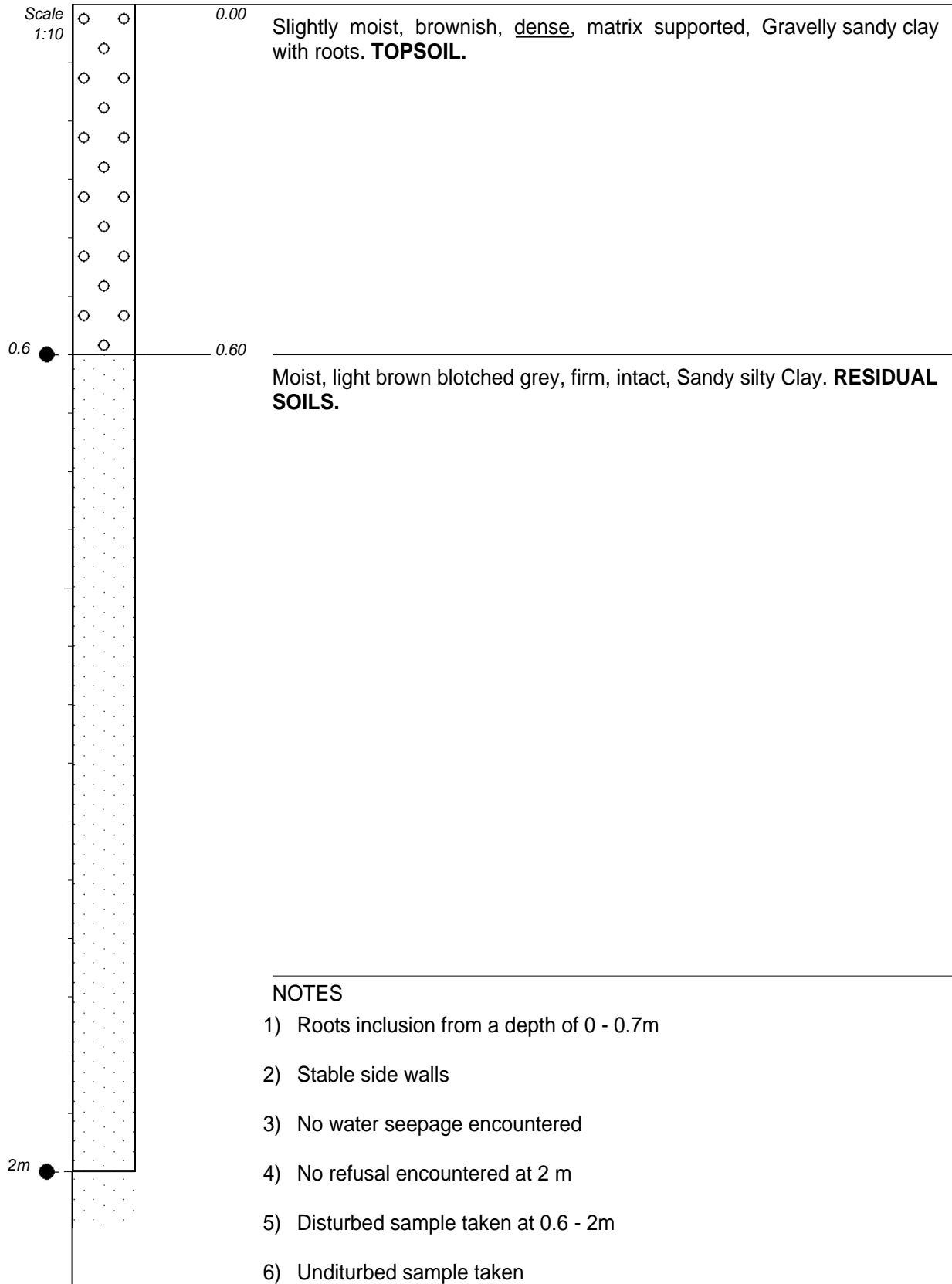
ELEVATION : 934m  
 X-COORD : 29°52'24.60"E  
 Y-COORD : 23° 3'8.74"S



CONTRACTOR :  
MACHINE : Tractor Loader Backhoe (TLB).  
DRILLED BY :  
PROFILED BY : Mavhetha Lavhelesani  
TYPE SET BY : Mavhetha Lavhelesani  
SETUP FILE : STANDARD.SET

INCLINATION :  
DIAM : 0.7 m  
DATE :  
DATE : 12/08/2021  
DATE : 28/09/2021 09:20  
TEXT : ..00\Examples\Examples.TXT

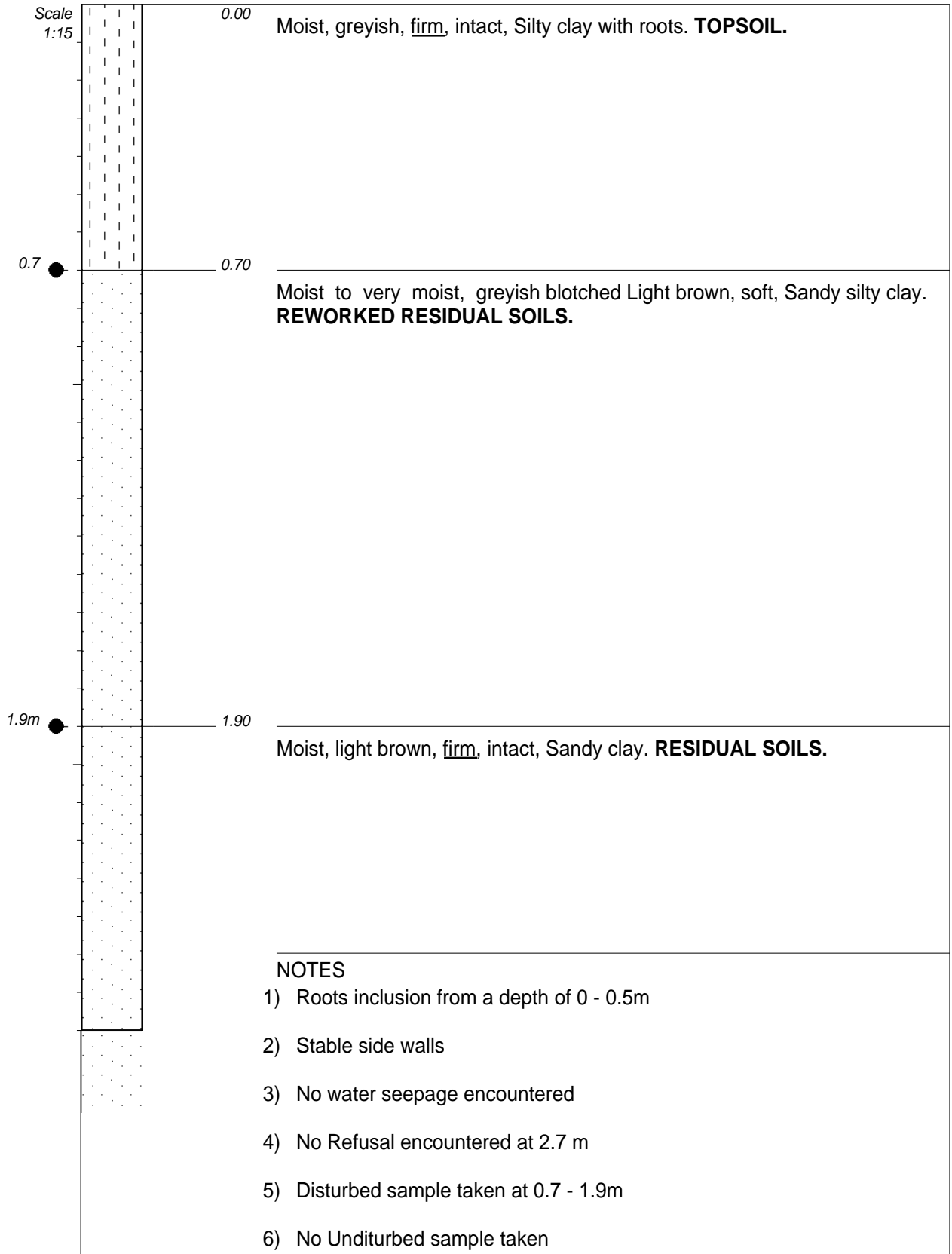
ELEVATION : 934m  
X-COORD : 29°52'19.79"E  
Y-COORD : 23° 3'10.04"S



CONTRACTOR :  
MACHINE : Tractor Loader Backhoe (TLB).  
DRILLED BY :  
PROFILED BY : Mavhetha Lavhelesani  
TYPE SET BY : Mavhetha Lavhelesani  
SETUP FILE : STANDARD.SET

INCLINATION :  
DIAM : 0.7 m  
DATE :  
DATE : 12/08/2021  
DATE : 28/09/2021 09:20  
TEXT : ..00\Examples\Examples.TXT

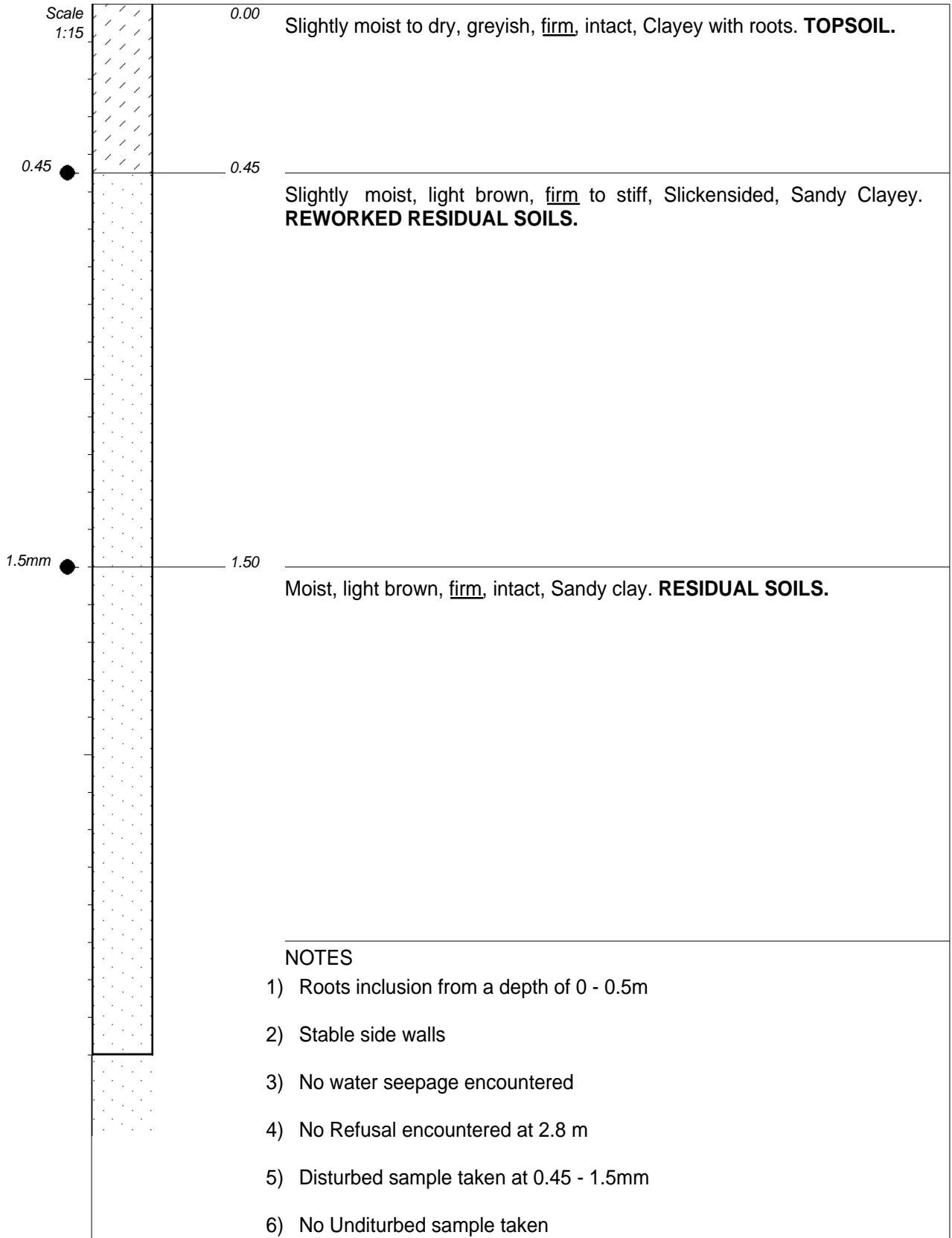
ELEVATION : 934m  
X-COORD : 29°52'16.79"E  
Y-COORD : 23° 3'13.43"S



CONTRACTOR :  
MACHINE : Tractor Loader Backhoe (TLB).  
DRILLED BY :  
PROFILED BY : Mavhetha Lavhelesani  
TYPE SET BY : Mavhetha Lavhelesani  
SETUP FILE : STANDARD.SET

INCLINATION :  
DIAM : 0.7 m  
DATE :  
DATE : 12/08/2021  
DATE : 28/09/2021 09:20  
TEXT : ..00\Examples\Examples.TXT

ELEVATION : 932m  
X-COORD : 29°52'23.15"E  
Y-COORD : 23° 3'12.32"S

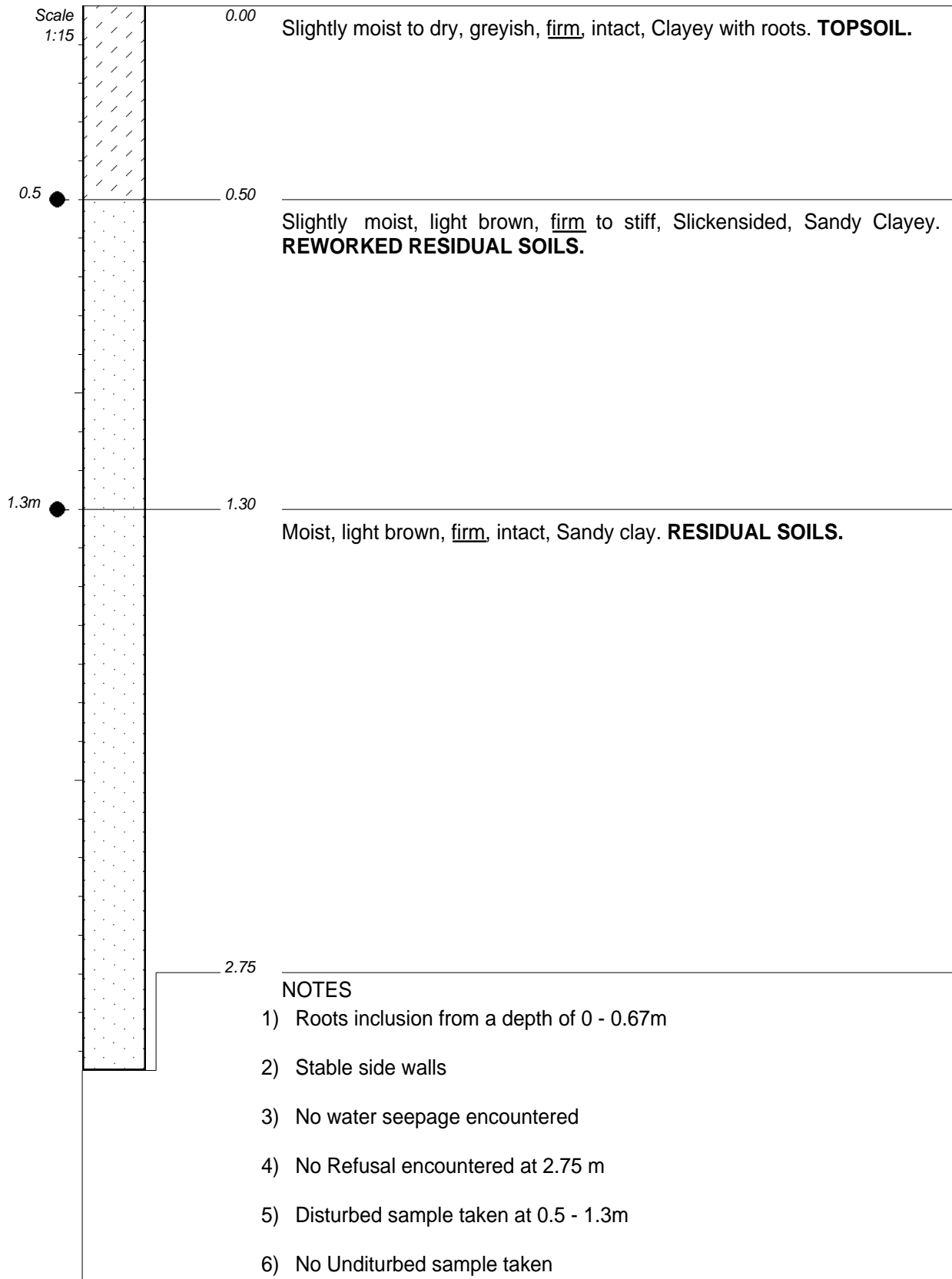


CONTRACTOR :  
MACHINE : Tractor Loader Backhoe (TLB).  
DRILLED BY :  
PROFILED BY : Mavhetha Lavhelesani  
TYPE SET BY : Mavhetha Lavhelesani  
SETUP FILE : STANDARD.SET

INCLINATION :  
DIAM : 0.7 m  
DATE :  
DATE : 12/08/2021  
DATE : 28/09/2021 09:20  
TEXT : ..00\Examples\Examples.TXT

ELEVATION : 933m  
X-COORD : 29°52'23.15"E  
Y-COORD : 23° 3'12.32"S

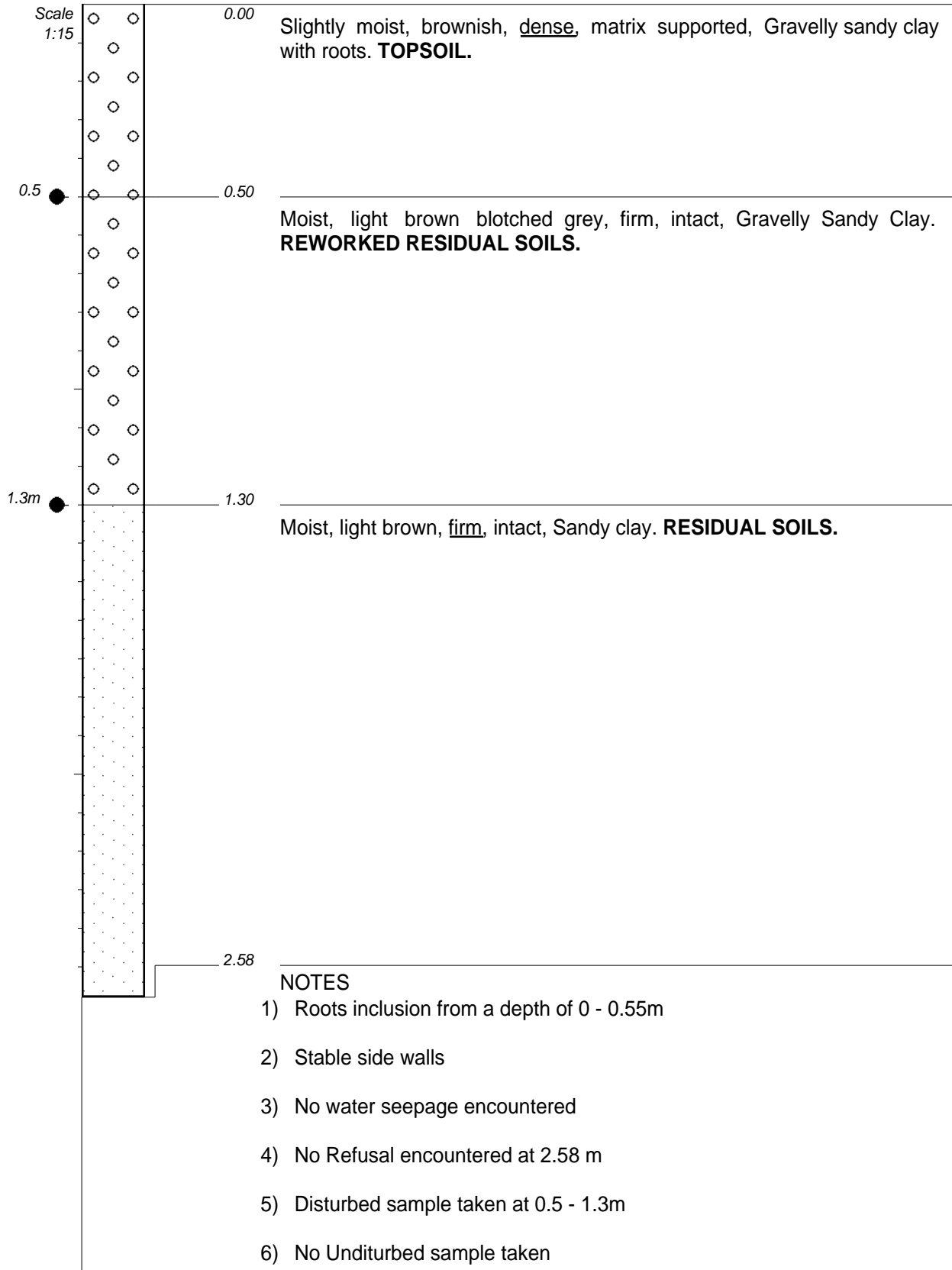




**CONTRACTOR :**  
**MACHINE :** Tractor Loader Backhoe (TLB).  
**DRILLED BY :**  
**PROFILED BY :** Mavhetha Lavhelesani  
**TYPE SET BY :** Mavhetha Lavhelesani  
**SETUP FILE :** STANDARD.SET

**INCLINATION :**  
**DIAM :** 0.7 m  
**DATE :**  
**DATE :** 12/08/2021  
**DATE :** 28/09/2021 09:20  
**TEXT :** ..00\Examples\Examples.TXT

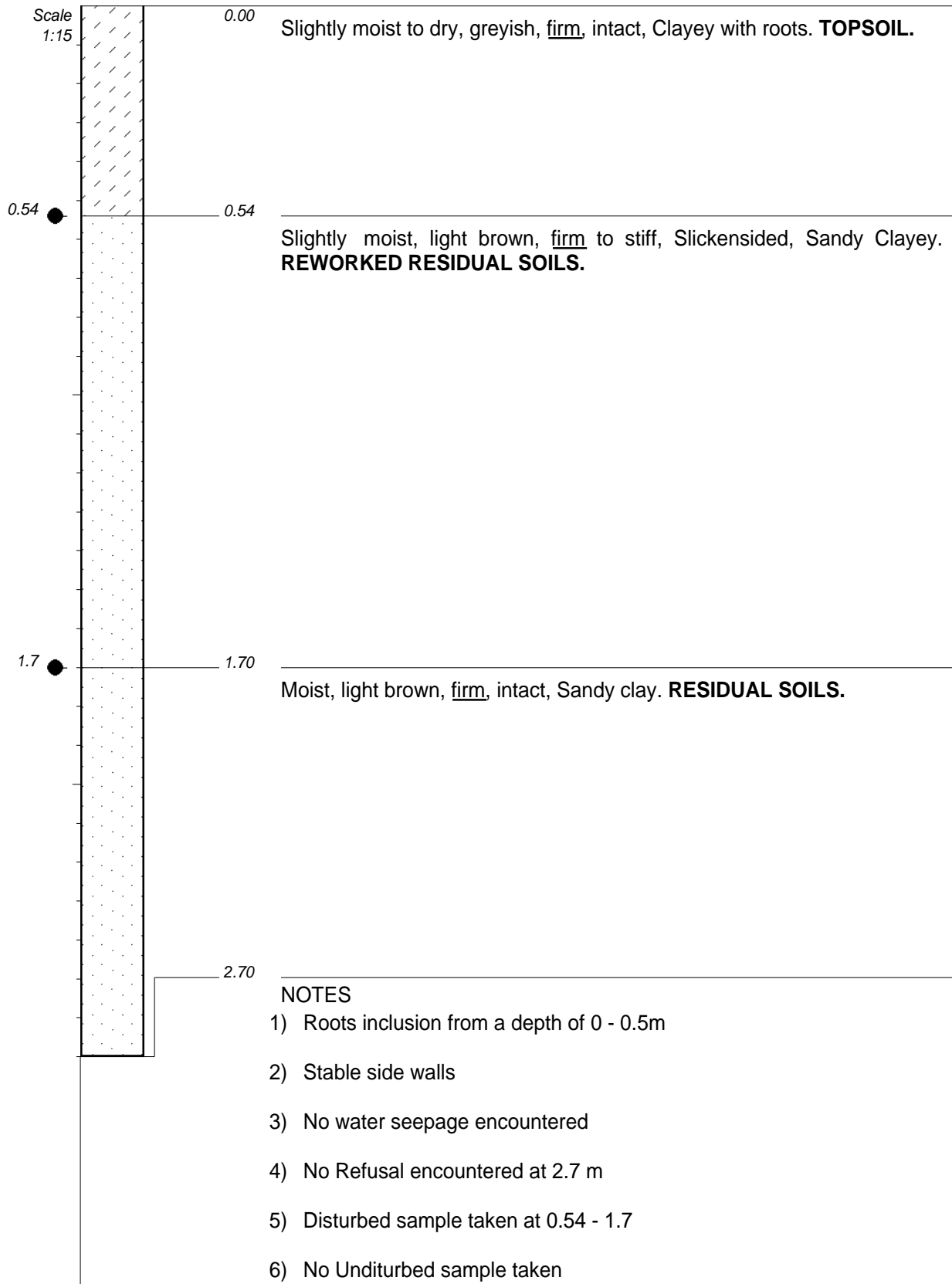
**ELEVATION :** 929m  
**X-COORD :** 29°52'25.36"E  
**Y-COORD :** 23° 3'16.58"S



CONTRACTOR :  
MACHINE : Tractor Loader Backhoe (TLB).  
DRILLED BY :  
PROFILED BY : Mavhetha Lavhelesani  
TYPE SET BY : Mavhetha Lavhelesani  
SETUP FILE : STANDARD.SET

INCLINATION :  
DIAM : 0.7 m  
DATE :  
DATE : 12/08/2021  
DATE : 28/09/2021 09:20  
TEXT : ..00\Examples\Examples.TXT

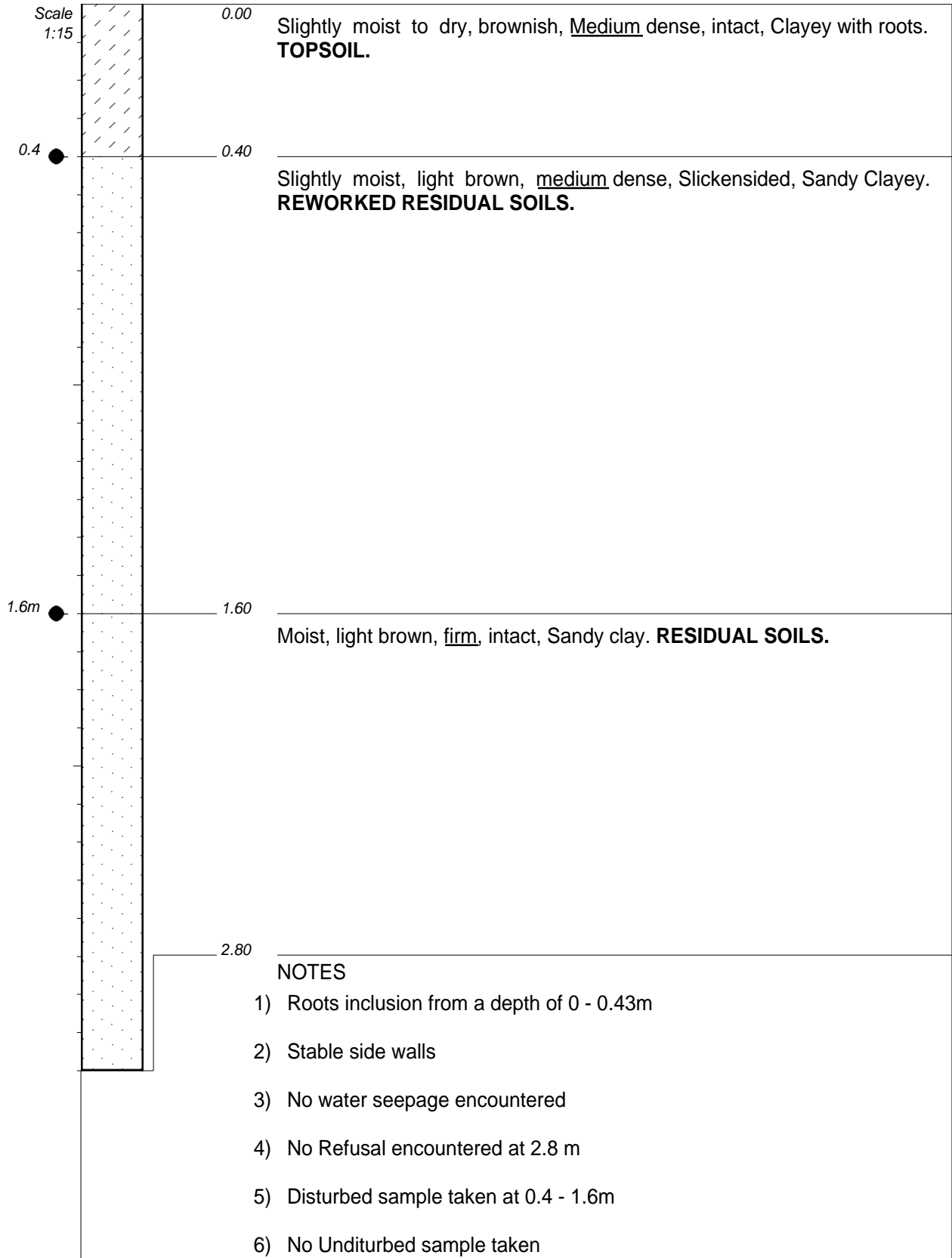
ELEVATION : 932m  
X-COORD : 29°52'19.28"E  
Y-COORD : 23° 3'17.47"S



CONTRACTOR :  
MACHINE : Tractor Loader Backhoe (TLB).  
DRILLED BY :  
PROFILED BY : Mavhetha Lavhelesani  
TYPE SET BY : Mavhetha Lavhelesani  
SETUP FILE : STANDARD.SET

INCLINATION :  
DIAM : 0.7 m  
DATE :  
DATE : 12/08/2021  
DATE : 28/09/2021 09:20  
TEXT : ..00\Examples\Examples.TXT

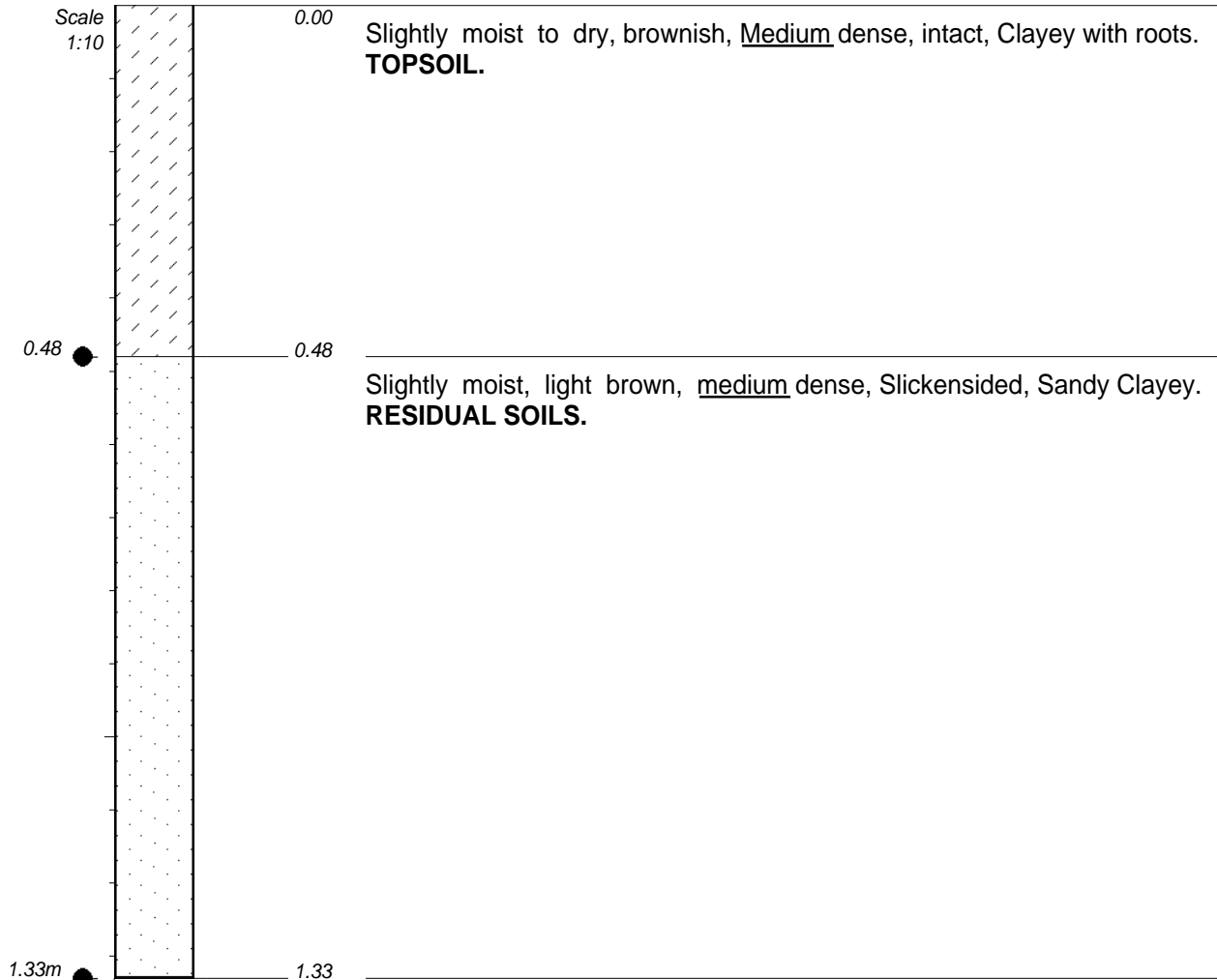
ELEVATION : 933m  
X-COORD : 29°52'13.56"E  
Y-COORD : 23° 3'17.49"S



CONTRACTOR :  
MACHINE : Tractor Loader Backhoe (TLB).  
DRILLED BY :  
PROFILED BY : Mavhetha Lavhelesani  
TYPE SET BY : Mavhetha Lavhelesani  
SETUP FILE : STANDARD.SET

INCLINATION :  
DIAM : 0.7 m  
DATE :  
DATE : 12/08/2021  
DATE : 28/09/2021 09:20  
TEXT : ..00\Examples\Examples.TXT

ELEVATION : 931m  
X-COORD : 29°52'12.51"E  
Y-COORD : 23° 3'20.84"S



**NOTES**

- 1) Roots inclusion from a depth of 0 - 0.6m
- 2) Stable side walls
- 3) No water seepage encountered
- 4) Refusal encountered at 1.33 m
- 5) Disturbed sample taken at 0.48 - 1.33m
- 6) No Undisturbed sample taken

CONTRACTOR :

MACHINE : Tractor Loader Backhoe (TLB).

DRILLED BY :

PROFILED BY : Mavhetha Lavhelesani

TYPE SET BY : Mavhetha Lavhelesani

SETUP FILE : STANDARD.SET

INCLINATION :

DIAM : 0.7 m

DATE :

DATE : 12/08/2021

DATE : 28/09/2021 09:20

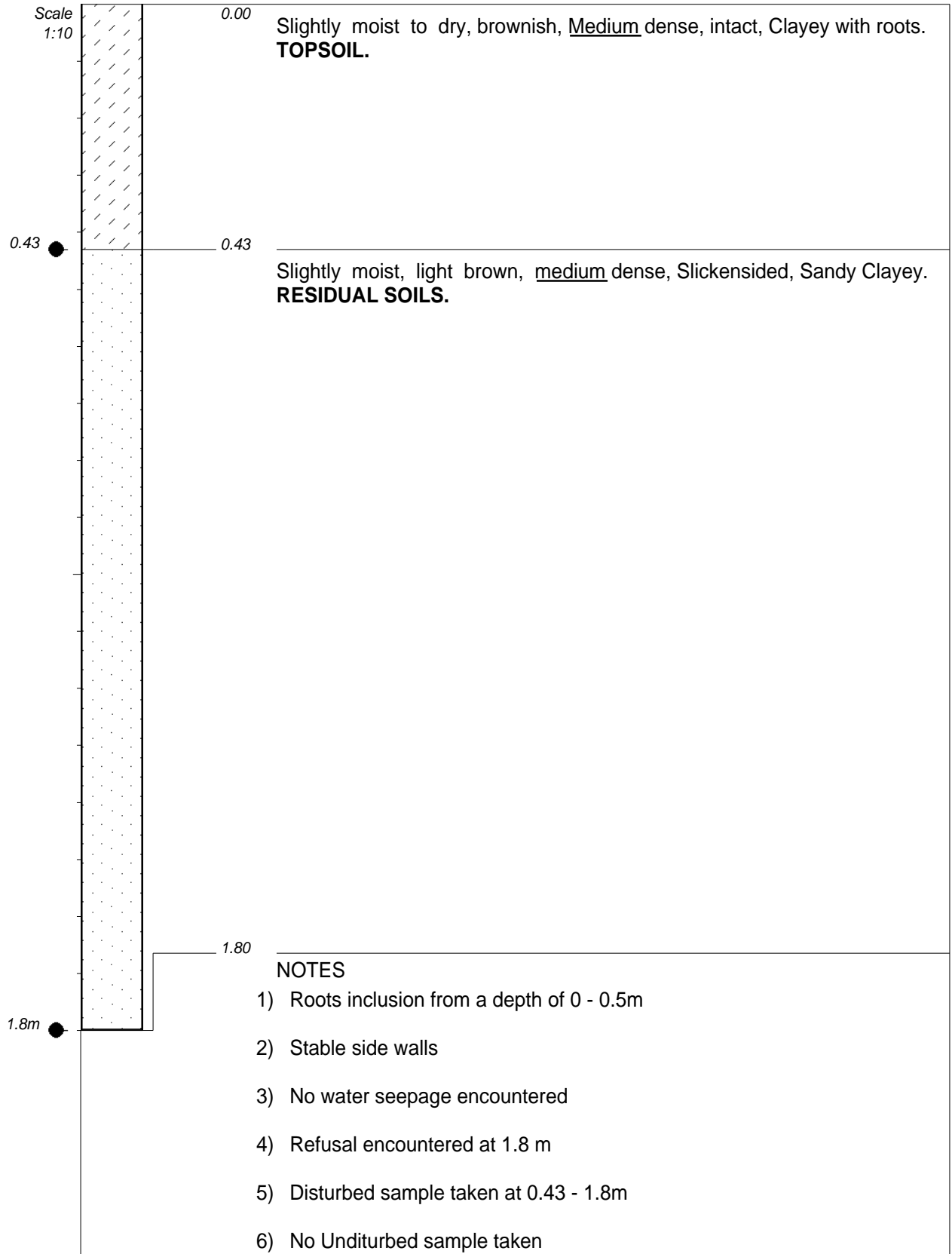
TEXT : ..00\Examples\Examples.TXT

ELEVATION : 928m

X-COORD : 29°52'19.07"E

Y-COORD : 23° 3'22.22"S

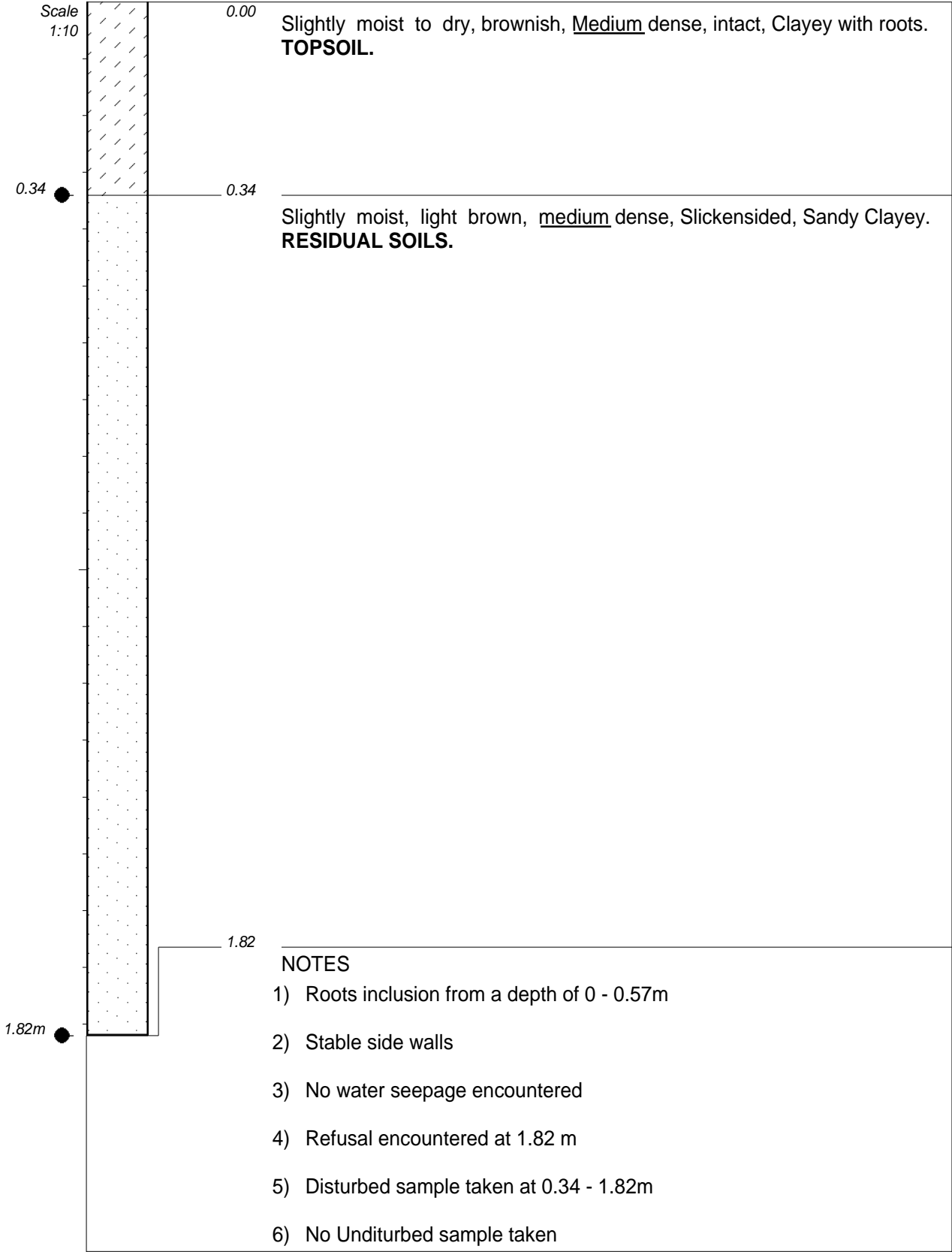
HOLE No: TP 10



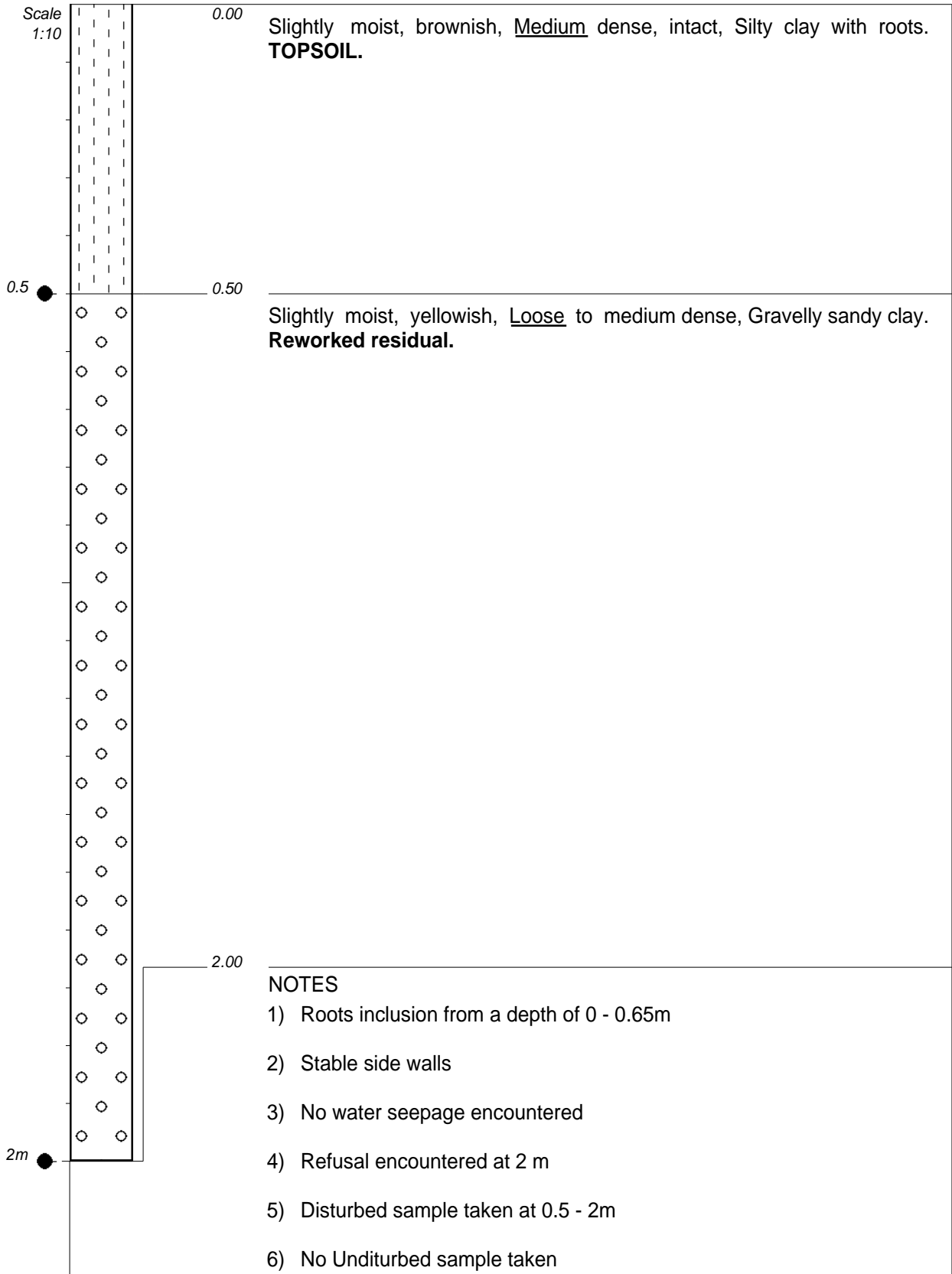
CONTRACTOR :  
MACHINE : Tractor Loader Backhoe (TLB).  
DRILLED BY :  
PROFILED BY : Mavhetha Lavhelesani  
TYPE SET BY : Mavhetha Lavhelesani  
SETUP FILE : STANDARD.SET

INCLINATION :  
DIAM : 0.7 m  
DATE :  
DATE : 12/08/2021  
DATE : 28/09/2021 09:20  
TEXT : ..00\Examples\Examples.TXT

ELEVATION : 926m  
X-COORD : 29°52'26.12"E  
Y-COORD : 23° 3'19.50"S



<b>CONTRACTOR :</b>	<b>INCLINATION :</b>	<b>ELEVATION :</b> 926m
<b>MACHINE :</b> Tractor Loader Backhoe (TLB).	<b>DIAM :</b> 0.7 m	<b>X-COORD :</b> 29°52'26.48"E
<b>DRILLED BY :</b>	<b>DATE :</b>	<b>Y-COORD :</b> 23° 3'24.70"S
<b>PROFILED BY :</b> Mavhetha Lavhelesani	<b>DATE :</b> 12/08/2021	
<b>TYPE SET BY :</b> Mavhetha Lavhelesani	<b>DATE :</b> 28/09/2021 09:20	
<b>SETUP FILE :</b> STANDARD.SET	<b>TEXT :</b> ..00\Examples\Examples.TXT	

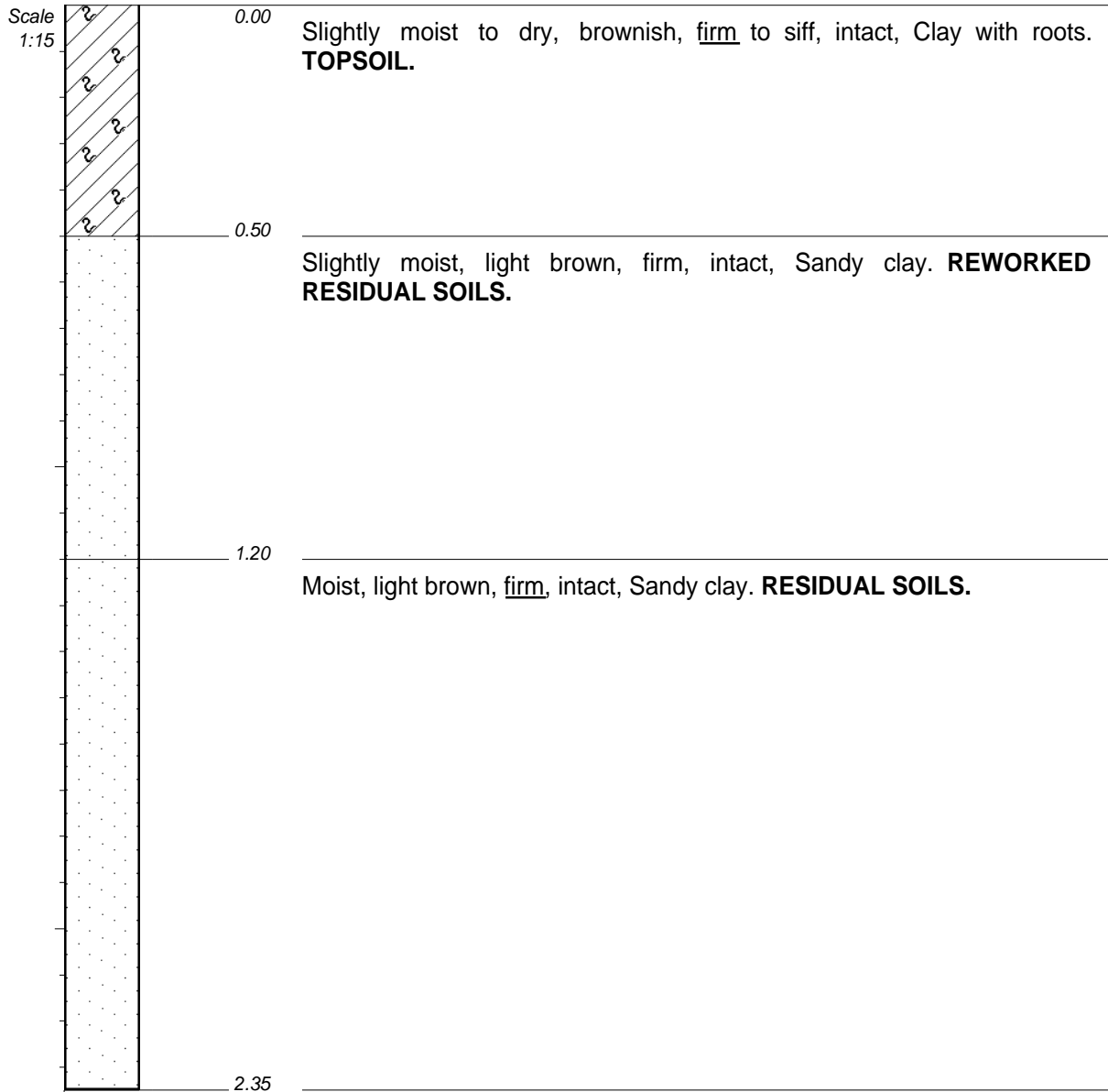


CONTRACTOR :  
MACHINE : Tractor Loader Backhoe (TLB).  
DRILLED BY :  
PROFILED BY : Mavhetha Lavhelesani  
TYPE SET BY : Mavhetha Lavhelesani  
SETUP FILE : STANDARD.SET

INCLINATION :  
DIAM : 0.7 m  
DATE :  
DATE : 12/08/2021  
DATE : 28/09/2021 09:20  
TEXT : ..00\Examples\Examples.TXT

ELEVATION : 928m  
X-COORD : 29°52'20.96"E  
Y-COORD : 23° 3'25.03"S





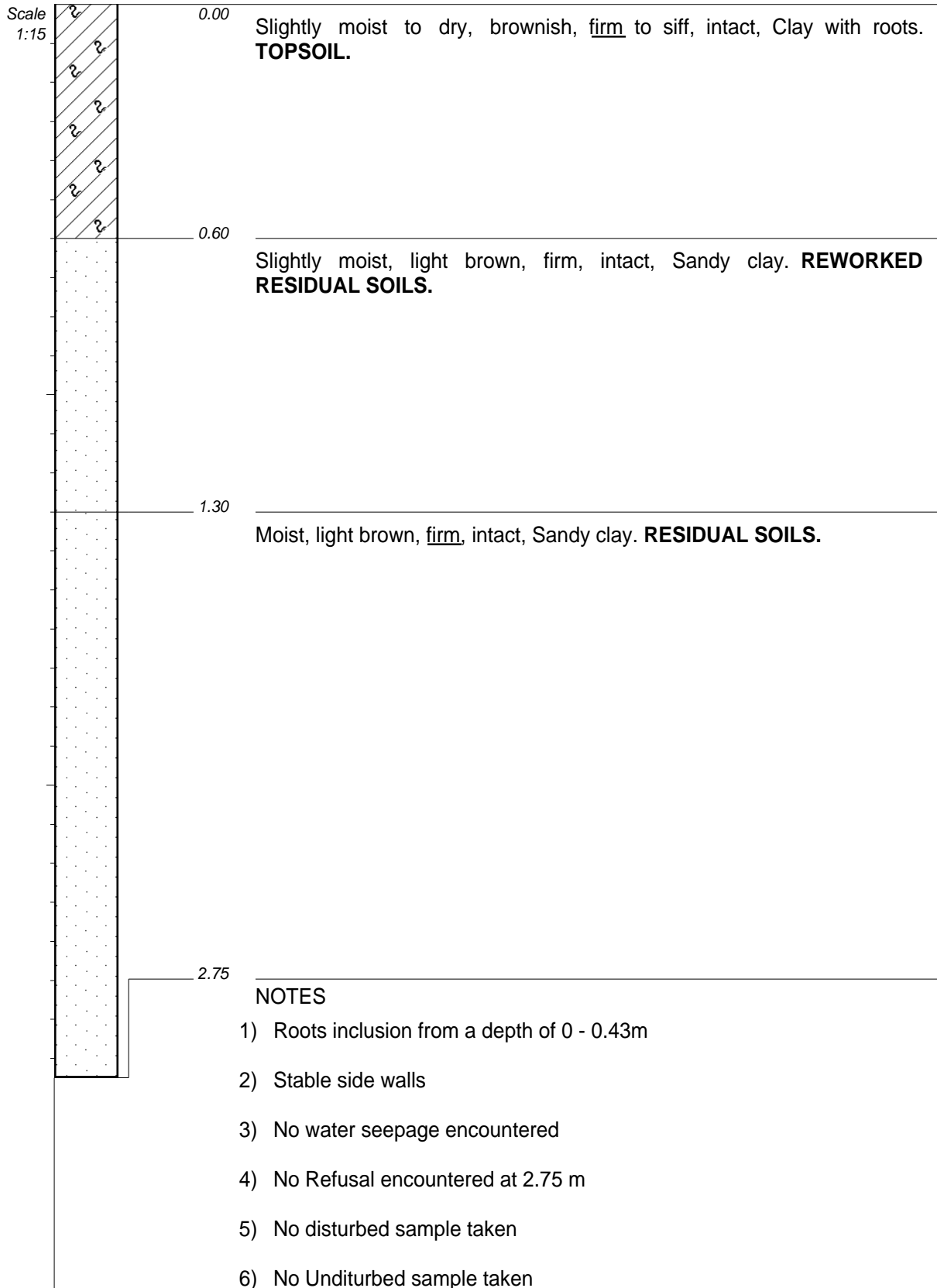
NOTES

- 1) Roots inclusion from a depth of 0 - 0.5m
- 2) Stable side walls
- 3) No water seepage encountered
- 4) Refusal encountered at 2.35 m
- 5) No Disturbed sample taken
- 6) No Undisturbed sample taken

CONTRACTOR :  
MACHINE : Tractor Loader Backhoe (TLB).  
DRILLED BY :  
PROFILED BY : Mavhetha Lavhelesani  
TYPE SET BY : Mavhetha Lavhelesani  
SETUP FILE : STANDARD.SET

INCLINATION :  
DIAM : 0.7 m  
DATE :  
DATE : 12/08/2021  
DATE : 28/09/2021 09:20  
TEXT : ..00\Examples\Examples.TXT

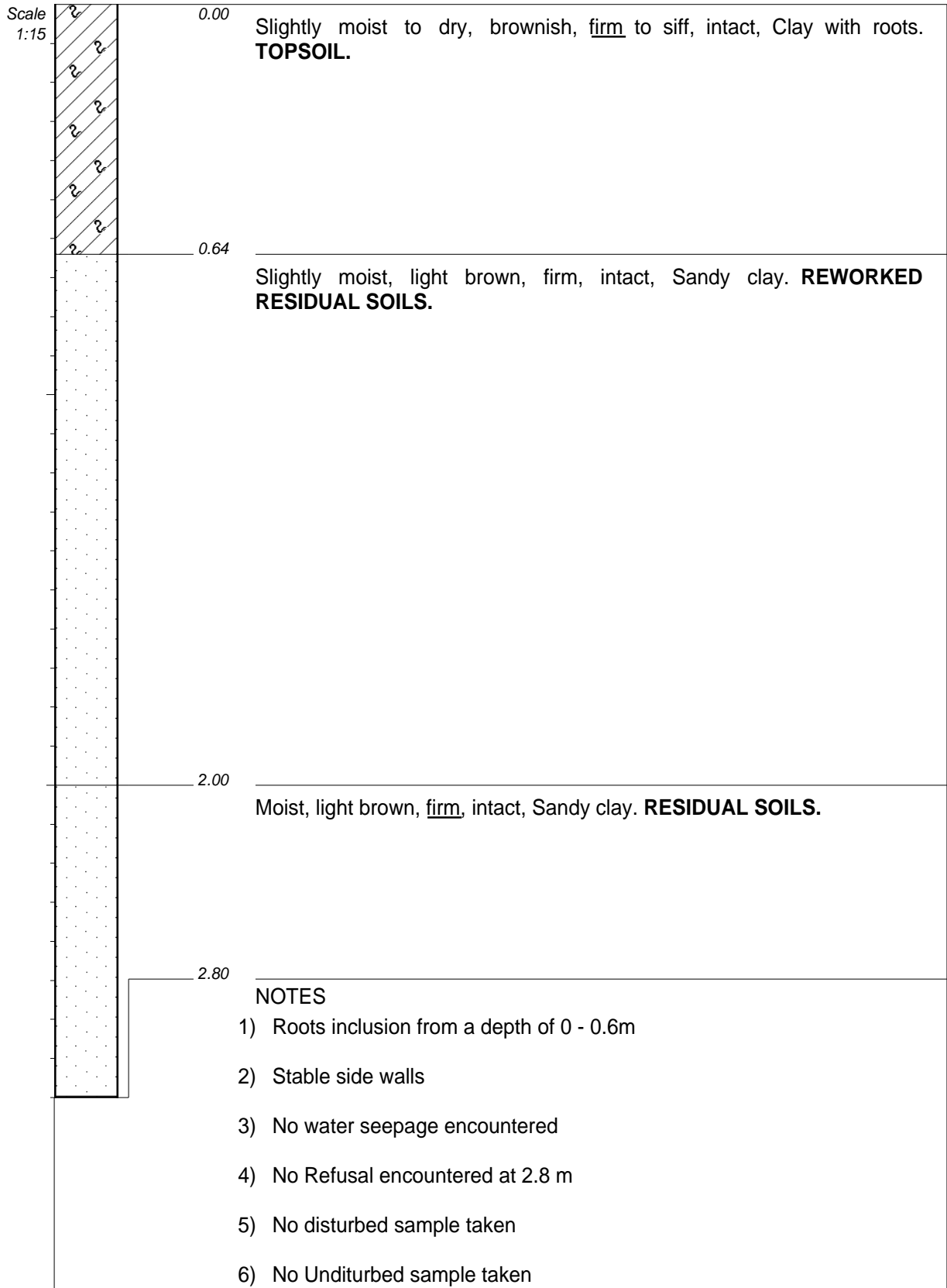
ELEVATION : 929m  
X-COORD : 29°52'14.10"E  
Y-COORD : 23° 3'24.43"S



CONTRACTOR :  
MACHINE : Tractor Loader Backhoe (TLB).  
DRILLED BY :  
PROFILED BY : Mavhetha Lavhelesani  
TYPE SET BY : Mavhetha Lavhelesani  
SETUP FILE : STANDARD.SET

INCLINATION :  
DIAM : 0.7 m  
DATE :  
DATE : 12/08/2021  
DATE : 28/09/2021 09:20  
TEXT : ..00\Examples\Examples.TXT

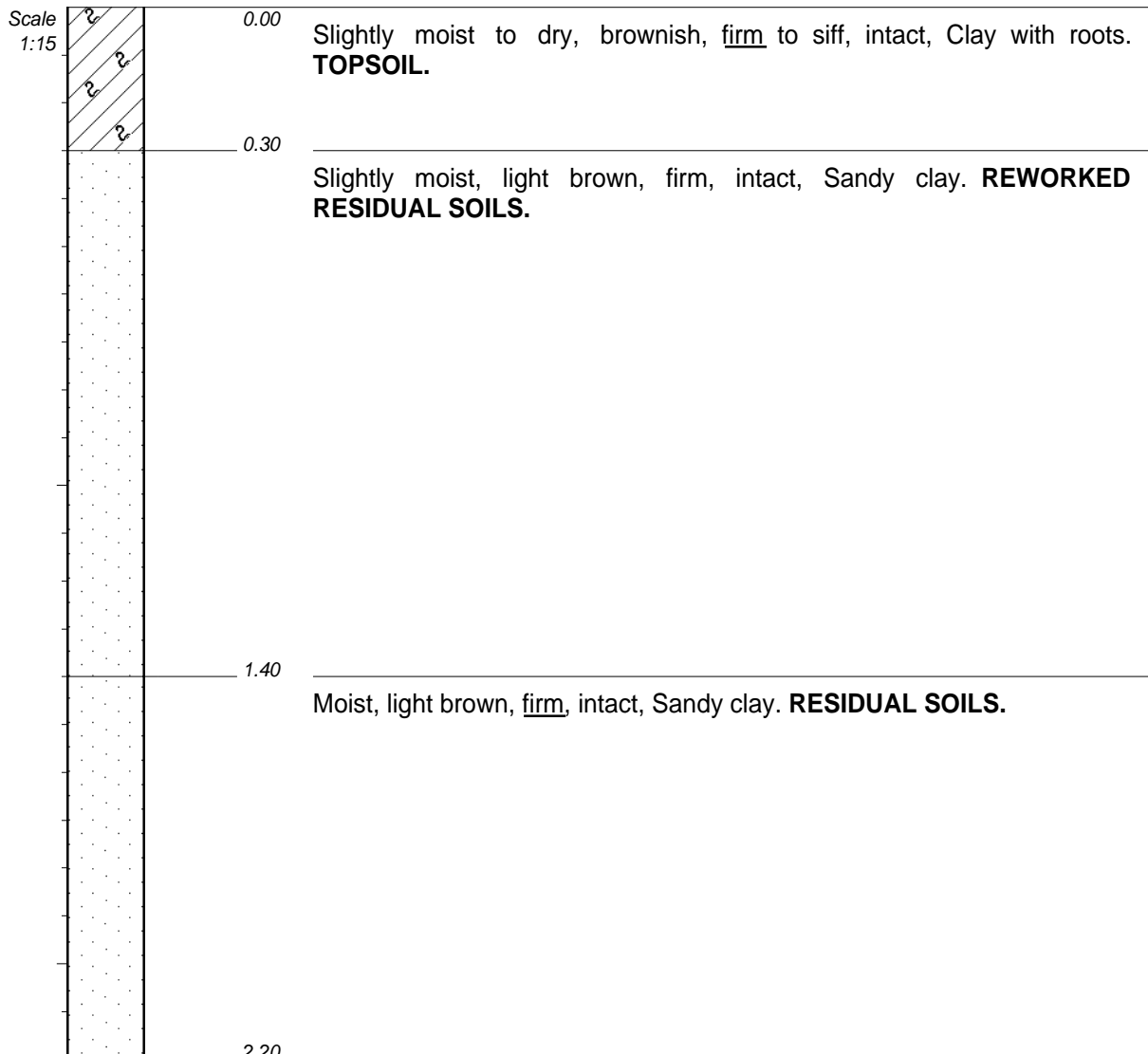
ELEVATION : 926m  
X-COORD : 29°52'22.72"E  
Y-COORD : 23° 3'30.28"S



CONTRACTOR :  
MACHINE : Tractor Loader Backhoe (TLB).  
DRILLED BY :  
PROFILED BY : Mavhetha Lavhelesani  
TYPE SET BY : Mavhetha Lavhelesani  
SETUP FILE : STANDARD.SET

INCLINATION :  
DIAM : 0.7 m  
DATE :  
DATE : 12/08/2021  
DATE : 28/09/2021 09:20  
TEXT : ..00\Examples\Examples.TXT

ELEVATION : 923m  
X-COORD : 29°52'28.79"E  
Y-COORD : 23° 3'29.06"S



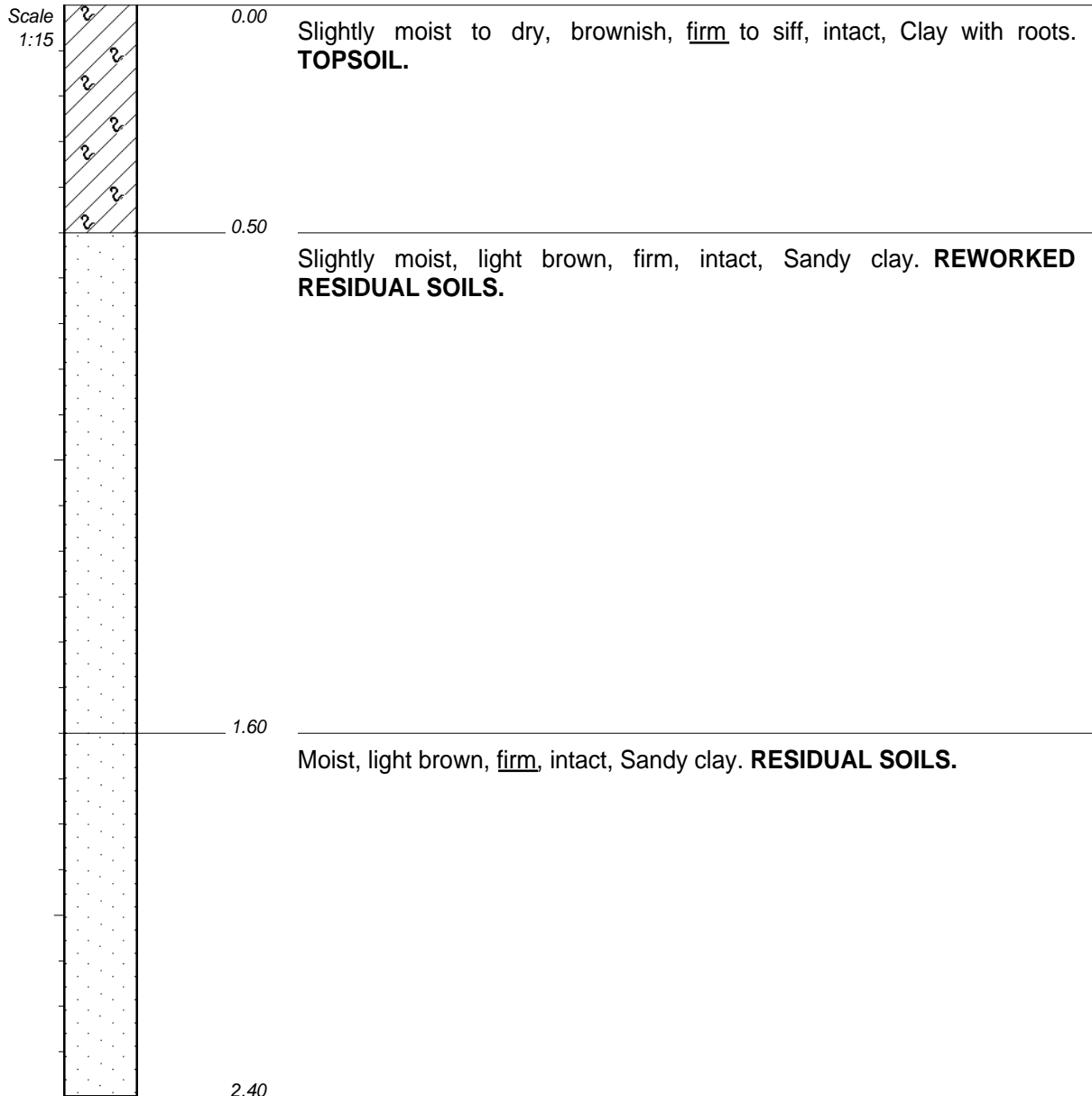
**NOTES**

- 1) Roots inclusion from a depth of 0 - 0.5m
- 2) Stable side walls
- 3) No water seepage encountered
- 4) Refusal encountered at 2.2 m
- 5) No disturbed sample taken
- 6) No Unditurbed sample taken

CONTRACTOR :  
MACHINE : Tractor Loader Backhoe (TLB).  
DRILLED BY :  
PROFILED BY : Mavhetha Lavhelesani  
TYPE SET BY : Mavhetha Lavhelesani  
SETUP FILE : STANDARD.SET

INCLINATION :  
DIAM : 0.7 m  
DATE :  
DATE : 12/08/2021  
DATE : 28/09/2021 09:20  
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ELEVATION : 922m  
X-COORD : 29°52'30.10"E  
Y-COORD : 23° 3'31.79"S










NOTES

- 1) Roots inclusion from a depth of 0 - 0.57m
- 2) Stable side walls
- 3) No water seepage encountered
- 4) Refusal encountered at 2.4 m
- 5) No disturbed sample taken
- 6) No Undisturbed sample taken

CONTRACTOR :  
MACHINE : Tractor Loader Backhoe (TLB).  
DRILLED BY :  
PROFILED BY : Mavhetha Lavhelesani  
TYPE SET BY : Mavhetha Lavhelesani  
SETUP FILE : STANDARD.SET

INCLINATION :  
DIAM : 0.7 m  
DATE :  
DATE : 12/08/2021  
DATE : 28/09/2021 09:20  
TEXT : ..00\Examples\Examples.TXT

ELEVATION : 924m  
X-COORD : 29°52'24.84"E  
Y-COORD : 23° 3'32.94"S

		GRAVELLY	{SA03}
		SANDY	{SA05}
		SILTY	{SA07}
		CLAY	{SA08}
		CLAYEY	{SA09}
Name ●		DISTURBED SAMPLE	{SA38}
		ROOTS	{SA40}

CONTRACTOR :  
 MACHINE :  
 DRILLED BY :  
 PROFILED BY :

INCLINATION :  
 DIAM :  
 DATE :  
 DATE :

ELEVATION :  
 X-COORD :  
 Y-COORD :

TYPE SET BY : *Mavhetha Lavhelesani*  
 SETUP FILE : STANDARD.SET

DATE : 28/09/2021 09:20  
 TEXT : ..00\Examples\Examples.TXT

**LEGEND**  
**SUMMARY OF SYMBOLS**

## Appendix E – Public Participation Process

**PROPOSED TOWNSHIP ESTABLISHMENT OF SITES ON  
REMAINDER OF PORTION 1 OF THE FARM NATURALLE  
LOKSASIEW 272 LS, TSHIKOTA EXT 3**

**BULK ENGINEERING SERVICES REPORT**

**October 2021, REV 01**

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## Abbreviations

AADD	-	Average Annual Daily Demand
ADWF	-	Average Dry Weather Flow
DWS	-	Department of Water and Sanitation
FAR	-	Floor Area Ratio
IDP	-	Infrastructure Development Plan
kℓ	-	Kilo Litres
kℓ/day	-	Kilo Litres per day
ℓ/s	-	Litres per second
m <sup>3</sup>	-	cubic metre
MAP	-	Mean Annual Precipitation
Mℓ /day	-	Mega litres per day
PSC	-	Project Steering Committee
PWWF	-	Peak Wet Weather Flow
RWS	-	Regional Water Scheme
SANRAL	-	South African National Roads Authority Limited
StatsSA	-	Statistics South Africa
VIP toilet	-	Ventilated Improved Pit toilet
WC	-	Water Committee

## **1 INTRODUCTION**

Dalimede Projects (PTY) LTD was appointed by Ngoti Development Consultants to prepare the bulk engineering services report for the proposed township establishment of sites on remainder of portion 1 of the farm Naturalle Loksasiew 272 LS, Tshikota Ext 3, Limpopo Province.

This report outlines the engineering services existing needed for the township, i.e. roads, water, sewer and electricity.

## **2 LOCALITY**

The site is situated 4km west of Louis Trichardt town CDB along the Rissik street - road R522. Louis Trichardt town is 100 kilometres north of Polokwane, along the N1 highway to Zimbabwe. The area is administered by the Makhado Local Municipality, in Vhembe District Municipality, Limpopo Province, South Africa. GPS coordinates of site are 23° 3'21.13"S 29°52'21.41"E.

The locality map is shown on the figures below.

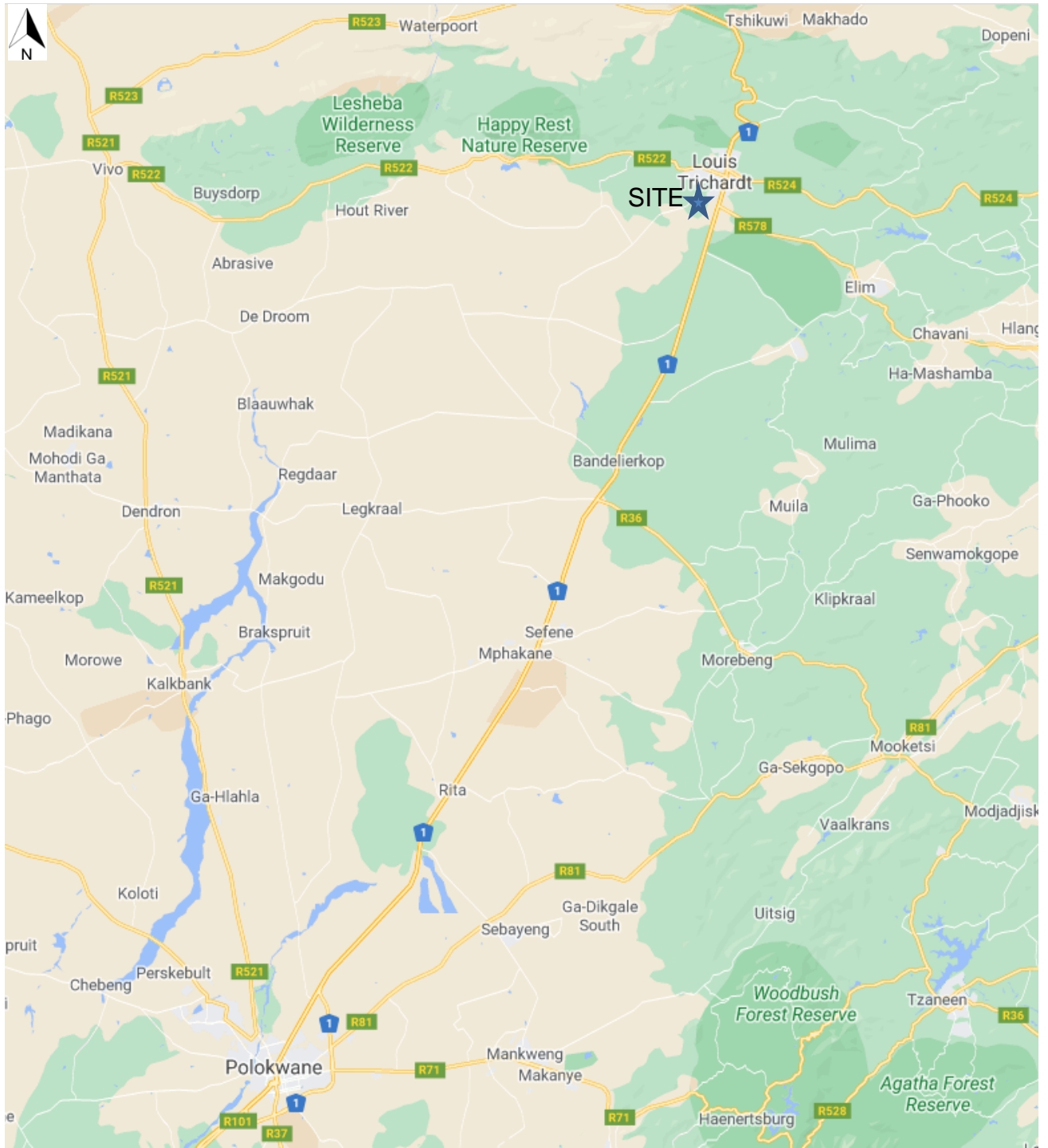


Figure 1 Locality plan

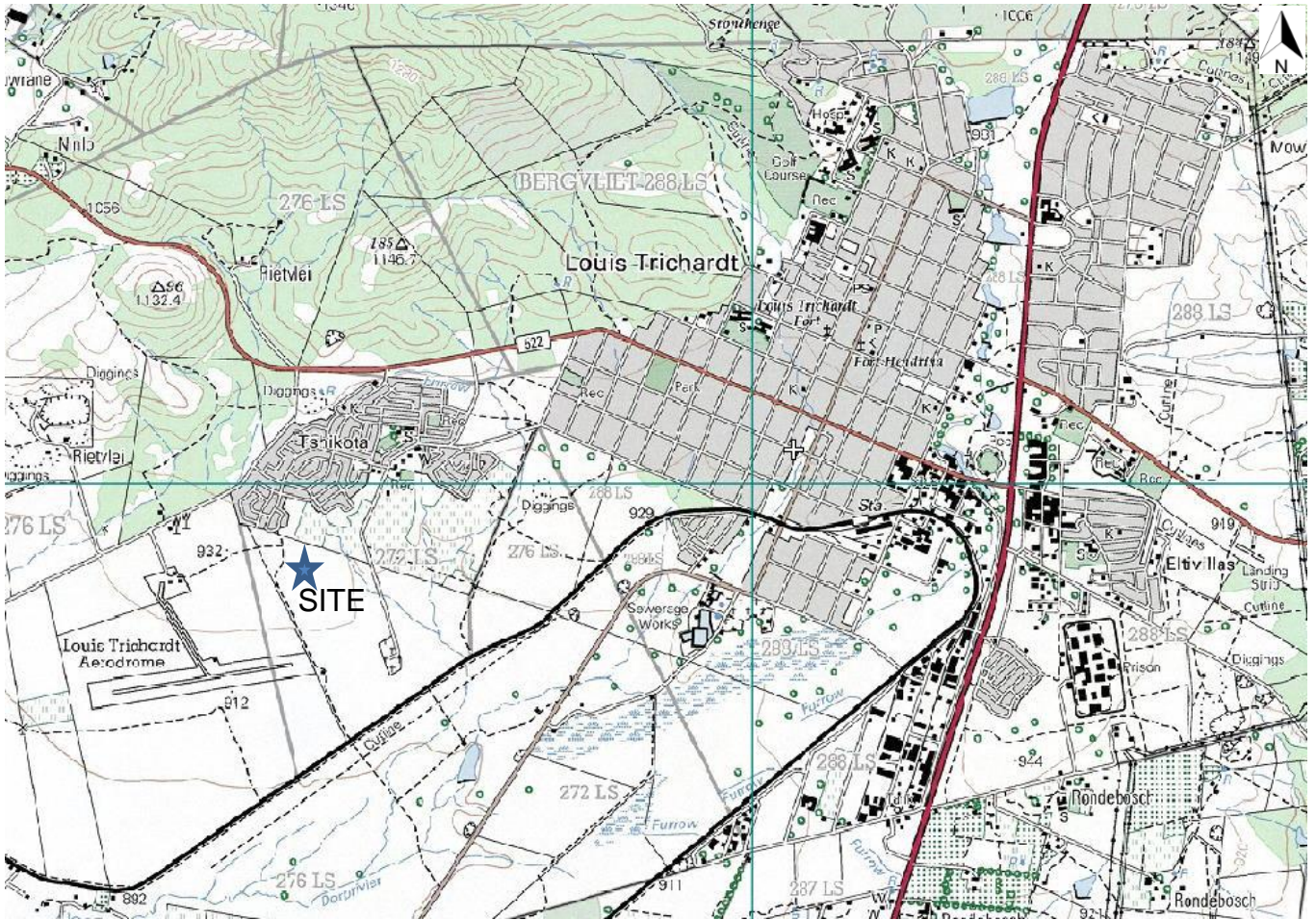


Figure 2 Site for development

### 3 TOWN PLANNING

The site is currently bush land. The site is to be developed to land uses shown in the table below.

Table 1 Land use proposed

LAND USE					
ZONING	LAND USE		NO. OF STANDS	AREA Ha.	% OF AREA
RESIDENTIAL 1	RESIDENTIAL 900m2		355	19.314244	57.4527
BUSINESS 1	BUSINESS		3	0.502308	1.4942
INSTITUTIONAL	PLACE OF WORSHIP		1	0.162500	0.4834
EDUCATIONAL	CRECHE		3	0.42374874	1.260494
PUBLIC OPEN SPACE	PARK		2	6.8910717	20.4984
STREETS	*	*	*	6.323795	18.8109
TOTAL	*		364	33,6177	100

The proposed land use layout is shown in the figure below.



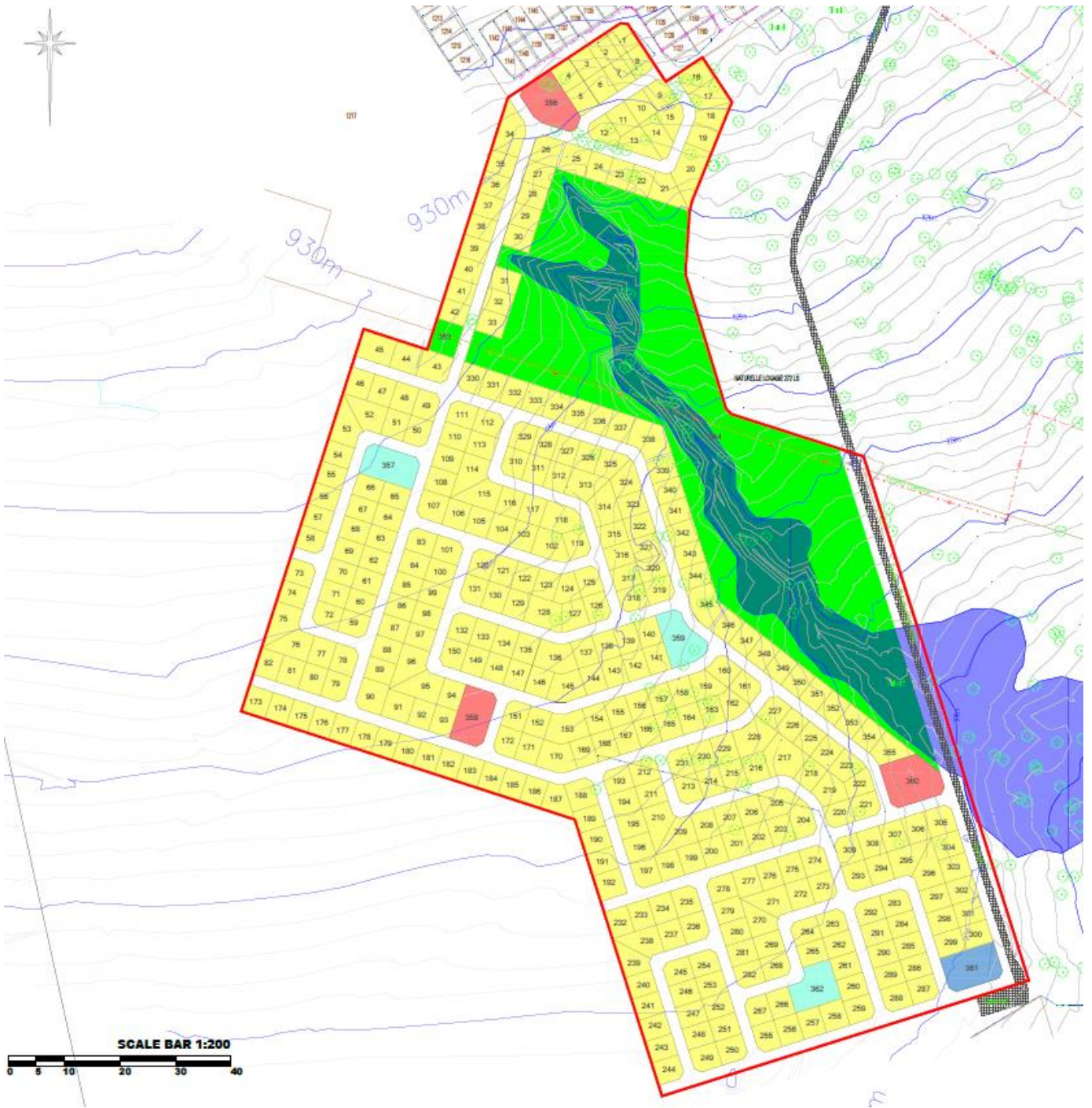


Figure 3 Proposed stands layout

#### 4 TOPOGRAPHY AND ACCESS

The site topography is generally flat. The mainly flat slopes allow for development without the need for massive site earthworks.



Figure 4 Topography

The site can be accessed from the existing adjacent streets and the paved road to the cemetery.

See the figure below.



Figure 5 Site access

## 5 WATER SERVICE

The Louis Trichardt town has existing municipal infrastructure for water, sewer, electricity, roads and stormwater.

### 5.1 Water source

Louis Trichardt town water sources are listed as follows:

- Albasini Dam, on Luvuvhu River. Located at 23 06 25S 30 07 30E. The actual water abstracted from the dam could not be confirmed.
- There is a borehole water scheme on the southern part of the Louis Trichardt town for augmentation of water. However, vandalism of the boreholes is a challenge. The actual water abstracted from the boreholes could not be confirmed.
- Nandoni Dam, on Luvuvhu River. Located at 22 58 53S 30 35 54E. The actual water abstracted from the dam could not be confirmed.

Water sources to the town are to be augmented by the Kutama-Sinthumule bulk water supply project, from Nandoni Dam. The project is expected to be completed in year 2022. The completion of this project will ensure a consistent water supply to Tshikota.

The project is administered by Vhembe District Municipality as the water services authority (WSA). Makhado Local Municipality has an oversight responsibility to ensure that all communities within the municipality are well supplied with water.

Raw water is then conveyed to the following water treatment works (WTW):

- Albasini WTW, with a design capacity of 10.1Mℓ/day.

GPS 23° 5'54.24"S 30° 6'49.87"E. The plant receives raw water from Albasini Dam.

Bulk meter water supply records could not be obtained.

## 5.2 Bulk pipelines

At the Albasini WTW, water is pumped through a 300mm diameter steel pipe that is 29km long. The pumping main conveys potable water to the Louis Trichardt reservoirs.

The outlet pipeline from the Tshikota reservoir has a diameter of 400mm. There is a 250mm diameter pipeline linked to the 400mm diameter outlet. The 250mm diameter pipeline conveys potable water to Tshikota.

## 5.3 Storage Tanks

There are six reservoirs servicing Louis Trichardt, viz;

- 13,6Mℓ reservoir and the 10ML all located at Mow kop site.
- Bergh Street 3.3 Mℓ reservoir,
- Hospital dam 0.5 Mℓ reservoir, Schimper Crescent street.
- Ext 7 reservoir 0,6 Mℓ, Schimper Crescent street.
- Tshikota 5Mℓ reservoir.

The total water storage capacity in Louis Trichardt is 33Mℓ.

The reservoirs are shown in the figure below.



Figure 6 Water storage

Tshikota township and the residential portion south of Rissik Street / Noordwes Street / R522 receives water from the 5Ml reservoir.

## 5.4 Water Reticulation

The area adjacent to the proposed development has an existing water network fed by the Tshikota reservoir shown in the figure above.

The proposed Tshikota development locality can be integrated to the existing water reticulation as it is located within a developed part of the town.



Figure 7 Existing fire hydrant on existing water reticulation

## 5.5 Water design criteria

The water design criterion to be used is listed in the table below. The design guidelines were adopted from the CSIR document titled:

*The Neighbourhood Planning and Design Guide, Creating Sustainable Human Settlements, developed by, Department of Human Settlements, Published by the South African Government, Version 1.1.*

Table 2 The water design criteria

Item	Design element	Criteria
i.	Average Annual Daily Demand (AADD), for Residential 1	0.6kℓ/c/day
ii.	Group / cluster housing, Medium density	0.5kℓ/unit/day
iii.	Business / commercial, FAR = 0.4	0.65kℓ/100m <sup>2</sup>
iv.	Park	12kℓ/hectare
v.	Municipal, FAR = 0.4	0.6kℓ/100m <sup>2</sup>
vi.	Institutional, FAR = 0.4	0.6kℓ/100m <sup>2</sup>
vii.	Educational, FAR = 0.4	0.6kℓ/100m <sup>2</sup>
viii.	Industrial, FAR = 0.4	0.4kℓ/100m <sup>2</sup>
ix.	Taxi Rank	0.3kℓ/100m <sup>2</sup>
x.	School, crèche, educational buildings	60 ℓ/student
xi.	Hospital, building according to Floor Area Ratio (FAR)	1.2 kℓ/100m <sup>2</sup>
xii.	Church buildings	0.3 kℓ/100m <sup>2</sup>
xiii.	Church grounds	1.2 kℓ/Ha
xiv.	School, crèche, educational buildings	60 ℓ/student
xv.	School, crèche, educational grounds	12 kℓ/Ha
xvi.	Institutional, FAR = 0.4	0.6 kℓ/100m <sup>2</sup>
xvii.	Sport grounds / Recreational	40 kℓ/Ha
xviii.	Residential stands; High density, small sized, with 20 to 12 units/Ha	11 kℓ/Ha/day
xix.	Flats, High density	0.35 kℓ/unit/day
xx.	Stadium: Buildings only	1.5 kℓ/1000seats
xxi.	Stadium: Grounds only	12 kℓ/Ha/day
xxii.	Hotels	0.2 kℓ/person
xxiii.	Golf estate - excluding golf course water requirements. Stand size less than 2670m <sup>2</sup> .	3kℓ/stand/day
xxiv.	Garage or filling station	0.8kℓ/100m <sup>2</sup>
xxv.	Frail care centres and hospitals, Building according to FAR	1.2kℓ/100m <sup>2</sup>
xxvi.	Gross Average Annual Daily Demand (GAADD)	Allow 10% losses
xxvii.	Daily Instantaneous Peak Factor (DIPF)	1.5
xxviii.	Design Peak Flow Rate (DPFR) for domestic flows.	25ℓ/s
xxix.	Maximum static head	90m
xxx.	Minimum residual head under conditions of domestic peak flow	10m
xxxi.	Maximum linear flow velocity under conditions of domestic peak flow	3m/s
xxxii.	Pipe type	uPVC
xxxiii.	Minimum pipe class	9



Item	Design element	Criteria
xxiv.	Fire flow at any one hydrant under the conditions of domestic peak flows (one hydrant at a time)	15 l/s
xxv.	Minimum residual head (fire plus domestic peak flow)	25m
xxvi.	Maximum linear flow velocity under conditions of fire-fighting	3m/s
xxvii.	DWS storage reservoirs sizing criteria: 48 Hrs x AADD Pumped from One Source 36 Hrs x AADD Pumped from Multiple Sources 24 Hrs x AADD Gravity Source	

## 5.6 Water demands

The estimated water demand for the proposed development is shown in the table below.

As per the table below, the water demand calculations indicate that the township will require 330.7kl/d AADD and 363.7kl/d Gross Average Annual Daily Demand.

Table 3 Water demand (proposed)

Land Use	No. of Erven	Area (Ha)	No. of Units	Floor Area Ratio, FAR	Unit flow	Unit of measure	Water Demand	
Residential 1 (Residential 900m <sup>2</sup> )	355	19.314244	355		0.6	kl/erf/day	213.0	kl/d
Business 1 (Business)	3	0.502308		0.4	0.65	kl/100m <sup>2</sup>	13.1	kl/d
Institutional (Place of worship)	1	0.162500		0.4	0.600	kl/100m <sup>2</sup>	3.9	kl/d
Educational (Creche)	3	0.42374874	300		0.060	kl/student	18.0	kl/d
Public Open Space (Park)	2	6.8910717			12.0	kl/Ha	82.7	kl/d
Streets		6.323795						
Totals	364	33.6177						
<b>Sub-total Average Annual Daily Demand (AADD)</b>							<b>330.7</b>	<b>kl/d</b>
Gross Average Annual Daily Demand (GAADD) (added 10%)							363.7	kl/d
Gross Average Annual Daily Demand (GAADD) (added 10%)							4.2	l/s
Multiply by a peak factor (Summer Peak Factor)					1.5	peak factor	545.6	kl/d
Multiply by a peak factor (Summer Peak Factor)					1.5	peak factor	6.3	l/s

The Fire flow is presented in the table below.

Table 4 Fire flow demands

<b>Fire category:</b>	<b>Quantity</b>	<b>Unit</b>
<b>Moderate risk 1: Industrial, business, highrise flats ≥ four storeys</b>		
Total fire flow	50	ℓ/s
Duration of design fire flow	4	Hours
Minimum Flow at one hydrant (ℓ/s)	25	ℓ/s
<b>Fire category:</b>		
<b>Low risk: Single residential housing</b>		
Total fire flow	15	ℓ/s
Duration of design fire flow	1	Hours
Minimum Flow at one hydrant (ℓ/s)	15	ℓ/s

The proposed development will add into the existing Tshikota households. The Tshikota existing households is shown in the table below.

Table 5 Existing Tshikota households

<b>Item</b>	<b>Description</b>	<b>No of Stands</b>
a)	Tshikota township (existing)	691
b)	Tshikota Extension 1 (existing)	898
	<b>Total (existing)</b>	<b>1 589</b>

Table 6 Water demand (Existing Tshikota)

Land Use	No. of Erven	No. of Units	Unit flow	Unit of measure	Water Demand	
Residential (Tshikota existing)	1589	1589	0.6	kl/erf/day	953.4	kl/d
Totals	1589					
<b>Sub-total Average Annual Daily Demand (AADD)</b>					<b>953.4</b>	<b>kl/d</b>
Gross Average Annual Daily Demand (GAADD) (added 10%)					1 048.7	kl/d
Gross Average Annual Daily Demand (GAADD) (added 10%)					12.1	l/s
Multiply by a peak factor (Summer Peak Factor)			1.5	peak factor	1 573.1	kl/d
Multiply by a peak factor (Summer Peak Factor)			1.5	peak factor	18.2	l/s

The combined water demand for the Tshikota existing and proposed is shown in the table below.

Table 7 Combined Tshikota water demand

Land Use	Water Demand	
Tshikota (existing)	953.4	kl/d
Tshikota Extension 3 (proposed)	330.7	kl/d
<b>Sub-total Average Annual Daily Demand (AADD)</b>	<b>1 284.1</b>	<b>kl/d</b>
Gross Average Annual Daily Demand (GAADD) (added 10%)	1 412.5	kl/d
Gross Average Annual Daily Demand (GAADD) (added 10%)	16.3	l/s
Multiply by a peak factor (Summer Peak Factor)	2 118.7	kl/d
Multiply by a peak factor (Summer Peak Factor)	24.5	l/s

## 5.7 Bulk water capacity

The combined Tshikota water demand AADD is 1 284.1kℓ/d.

The Tshikota reservoir has a capacity of 5Mℓ and receives water from a pumped source.

Tshikota required storage = 1284.1kℓ/d x 2 = 2568.2kℓ/d

Hence the Tshikota reservoir is adequate.

The capacity of the existing 250mm bulkline conveying water to Tshikota is shown in the table below.

Table 8 Pipeline existing capacity

<b>BULKLINE</b>	<b>DIAMETER</b>	<b>MAX CAPACITY (at V=1.2m/s)</b>		<b>WATER SUPPLY</b>	
<b>DIAMETER</b>	<b>(mm)</b>	<b>Flow Q (ℓ/s)</b>	<b>Flow Q (m3/s)</b>	<b>Supply (m<sup>3</sup>/d)</b>	<b>Supply (Mℓ/d)</b>
250mm	250	58.90	0.059	5 089.38	5.09

The combined Tshikota peak water demand of 24.5ℓ/s is less than the capacity of the existing 250mm diameter pipeline with a capacity of 58.9ℓ/s.

Therefore, the existing 250mm diameter bulk pipeline for Tshikota is adequate.

The bulk water supply from Albasini WTW is not adequate for the Louis Trichardt water demand. In order to resolve the inadequate bulk water supply, the Vhembe District Municipality and the Department of Water and Sanitation (DWS) are currently constructing the bulk pipeline from Valdezia to Louis Trichardt, i.e. the Kutama-Sinthumule bulk water supply project. The water allocation for Louis Trichardt from Nandoni Dam is 218 ℓ/s (18.8Mℓ/day).

## **5.8 Water bulk line proposed**

The proposed development will tap-off existing water bulk lines. The proposed bulk line connection is expected to be 1km long due to the close integration of the site to existing water services.

Approval to crossing road servitudes will require prior approval from authorities before construction commencement.

## **6 SEWER SERVICE**

### **6.1 Existing wastewater treatment plant**

The Louis Trichardt town generated wastewater is treated at the following wastewater treatment works (WWTW):

- Louis Trichardt WWTW. GPS 23° 3'27.55"S 29°53'50.55"E. The activated sludge plant has a design capacity of 7.3Mℓ/day. The actual sewer flow handled by this plant could not be confirmed.
- Reitvlei WWTW, new. GPS 23° 4'13.43"S 29°53'5.93"E. The plant has a design capacity of 5Mℓ/day. The new WWTW has an additional 5Mℓ/day upgrade provision made at the inlet works. The actual sewer flow handled by this plant could not be confirmed.

The total wastewater treatment capacity in Louis Trichardt is therefore 12.3Mℓ/day with an additional 5Mℓ/day in the planning stage.

The Louis Trichardt WWTW is servicing the whole of the area west of the N1 and part of Newtown.

Reitvlei WWTW is servicing parts of the area on the east of the N1 (Eltivillas, new town houses) and the industry.

The WWTW's are located as shown in the figure below.



Figure 8 WasteWater Treatment Works

## 6.2 Bulk sewer

Sewer bulklines in the town flow to the existing wastewater treatment works. The proposed development is within the sewer basin of the sewerage of the town.

The sewer outfall from Tshikota is shown in the figures below.

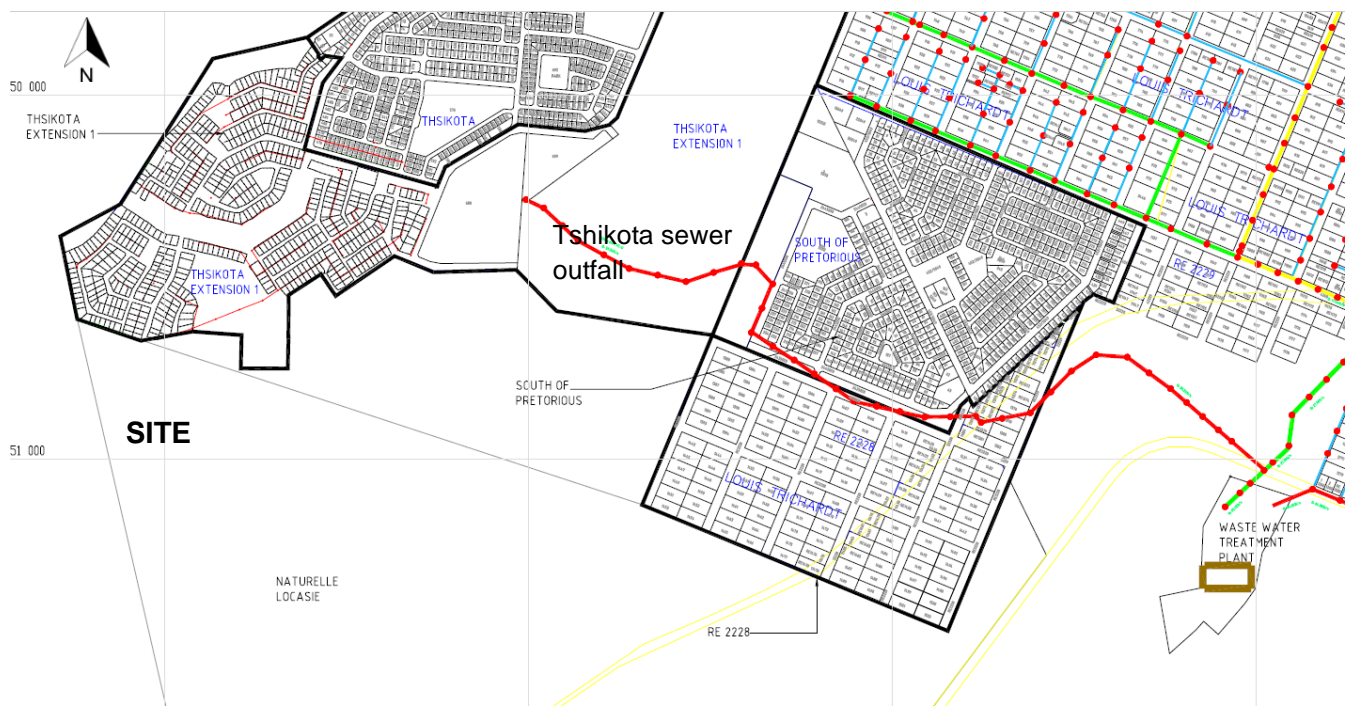


Figure 9 Existing sewer lines

Blockages are frequently experienced on the Tshikota outfall.





Figure 10 Existing sewer outfalls

### 6.3 Sewer flows

The design guidelines were adopted from the CSIR document titled:

*The Neighbourhood Planning and Design Guide, Creating Sustainable Human Settlements, developed by, Department of Human Settlements, Published by the South African Government, Version 1.1.*

Table 9 Sewer design flow

Land Use	No. of Erven	Area (Ha)	Water Demand		Sewer Return	Sewer Flow	
				kℓ/d			kℓ/d
Residential 1 (Residential 900m <sup>2</sup> )	355	19.31	213.0	kℓ/d	85%	181.1	kℓ/d
Business 1 (Business)	3	0.50	13.1	kℓ/d	85%	11.1	kℓ/d
Institutional (Place of worship)	1	0.16	3.9	kℓ/d	85%	3.3	kℓ/d
Educational (Creche)	3	0.42	18.0	kℓ/d	85%	15.3	kℓ/d
Public Open Space (Park)	2	6.89	82.7	kℓ/d	85%	70.3	kℓ/d
Streets		6.32					
Totals	364	33.62	330.7				
<b>Sub-total Sewer ADWF</b>						<b>281.1</b>	<b>kℓ/d</b>
15% Extraneous flow						42.2	kℓ/d
Gross Sewer						323.2	kℓ/d
Gross Sewer Flow						3.7	ℓ/s
Peak Factor						2.5	
Peak Sewer Flow						9.4	ℓ/s

The proposed development will have a sewer ADWF of 281.1kℓ/d and a gross sewer flow of 323.2kℓ/d.

The combined Tshikota wastewater generation is shown in the table below.

Table 10 Combined Tshikota wastewater

Land Use	Water Demand		Sewer Return	Sewer Flow	
Tshikota (existing)	953.4	kℓ/d	85%	810.4	kℓ/d
Tshikota Extension 3 (proposed)	330.7	kℓ/d	85%	281.1	kℓ/d
Totals	1284.1				
<b>Sub-total Sewer ADWF</b>				<b>1 091.4</b>	<b>kℓ/d</b>
15% Extraneous flow				163.7	kℓ/d
Gross Sewer				1 255.2	kℓ/d
Gross Sewer Flow				14.5	ℓ/s
Peak Factor				2.5	
Peak Sewer Flow				36.3	ℓ/s

#### **6.4 WasteWater bulk capacity**

At percent of ratio to full depth (diameter) 70% and at 1.25% slope, Manning's roughness coefficient  $n = 0.011$ . This existing Tshikota 200mm diameter sewer pipeline has a capacity of 36.3 l/s.

The estimated peak sewer flow from the combined Tshikota is 36.3 l/s.

This combined wastewater flow is at 100% of the pipe capacity of the existing sewer pipeline.

Hence the capacity of existing Tshikota sewer outfall is NOT sufficient to handle peak flows.

Maintenance staff, at Rietvlei WWTW, indicated that they received sewer flows that are less than the design capacity, hence indicating availability of spare capacity of the Rietvlei WWTW.

#### **6.5 Sewer infrastructure proposed**

The adjacent properties are currently serviced by an existing Tshikota 200mm diameter sewer outfall passing above the proposed development.

This existing Tshikota sewer outfall is currently overloaded as evidenced by constant sewer blockages.

A proposed 2.6km sewer outfall and sewer pumpstation to service the new development is shown in the figure below.



Figure 11 Proposed sewer outfall

## 7 ELECTRICITY

There is existing electricity supply infrastructure in the town and adjacent to the site. This can be utilised to supply the development, subject to approval from the power authority.



Figure 12 Electrical powerline in vicinity

## 8 TOWNSHIP ROADS

There is an existing functioning road network that can be used to access the proposed development.

The road infrastructure to internally service the development will be the standards of the Red Book, TMH, TRH books and the local municipality.

### 8.1 Classification of roads

Table 11 Classification of roads

Description	Class no.	Function	Reserve width	Roadway width
Access Road	5d	Access from existing bounding road	15m	7.4m
Internal Service Road	5f	Internal Road	13	6m
Internal Service Road	5f	Internal Road	10	6m

### 8.2 Geometric Design Standards

Table 12 Class 5d – Access road

Design speed	60km/h
Minimum centre line radii	50m
Minimum gradient	0.5%
Favoured maximum gradient	10%
Maximum grade/grade length	12.5% over 70m
Maximum K-value : Crest	16
: Sag	16

Table 13 Class 5f – Internal roads

<b>Design speed</b>	<b>30km/h</b>
Minimum centre line radii	30m
Minimum gradient	0.5%
Favoured maximum gradient	12%
Maximum grade/grade length	16% over 50m
Maximum K-value : Crest	6
: Sag	8

### 8.3 Pavement Design

The proposed pavement designs are based on anticipated traffic volumes and ground conditions, a detailed pavement design will require a geotechnical centreline investigation report.

The table below shows the proposed pavement design for the development.

Table 14 Proposed pavement design

<b>Design</b>	<b>Description</b>
Pavement	80mm paving / 30mm Premix Asphalt
Base	150mm Thick natural gravel stabilised with Cement to create C4 material compacted to 97% of Mod AASHTO
Subbase	150mm Thick natural gravel G7 material compacted to 97% of Mod AASHTO
Upper Selected Layer	150mm Thick Natural gravel G7 material compacted to 97% of Mod AASHTO Density.
Lower Selected Layer	150mm Thick Natural gravel G7 material compacted to 97% of Mod AASHTO Density.
Roadbed & Fill (where required)	150mm Thick layers compacted to 90% of Mod AASHTO Density. Minimum CBR= 3 at 90% of Mod AASHTO Density- G9



## 9 STORMWATER DRAINAGE

The town has a functioning stormwater system. However, the stormwater system does not reach the proposed development. Stormwater generated onsite can be channelled to follow the natural slope of the ground, to the lowest point. It is envisioned to use Sustainable Urban Drainage Systems (SuDS) to manage stormwater runoff from the site. A stormwater management plan will need to be submitted to the municipality before construction starts. Extraneous stormwater from above the site will be accommodated over the site.

### 9.1 Stormwater systems

Stormwater runoff onsite will be handled through an internal stormwater system that will be provided to drain the site in a safe and efficient way. It is proposed to make use of SuDS to manage the stormwater runoff before being discharged into the natural water courses.

Stormwater discharge control will be applied in order to reduce the damaging effect of the increase in runoff due to densification.

### 9.2 Hydrology

The hydrological data used in the design of the stormwater drainage system is shown in the table below.

Table 15 Hydrological data

<b>Hydrological Data</b>	
a) Flood return period	1: 2 years for storm water pipe system. 1: 5 years for the combined stormwater pipe and road systems
b) Average yearly rainfall	808mm
c) Minimum time of concentration and run	As per Local Municipality Guidelines
d) Design Method	Rational method

### 9.3 Design Standards

The table below lists the standards to be used in the design of the stormwater drainage system:

Table 16 Stormwater design standard

<b>Design Element</b>	<b>Specification</b>
a) Minimum pipe size	600 concrete
b) Minimum pipe gradient	0.67%
c) Storm water details	Local Municipal Standard Details

## 10 SOLID WASTE

A regional landfill situated nearest the site is to be used to dispose solid waste. The local municipality is responsible for connecting and disposing the solid waste. If the municipality is not able to provide this service, then a private company will need to be appointed by the development owners for the service.

A refuse area with bins will be done onsite and solid waste will be disposed of at the municipal dump site as per the municipal health bylaws.

The Neighbourhood Planning and Design Guide, Creating Sustainable Human Settlements, developed by, Department of Human Settlements, Published by the South African Government, Version 1.1.

The solid waste generation range from 0.41 kg per capita per day in the poor areas, to 1.29 kg per capita per day.

A rate of 0.6kg/c/d was adopted for the township. Solid waste will be generated by the development.

Population estimate = 355 residential erf x 4 people per erf = 1420 people

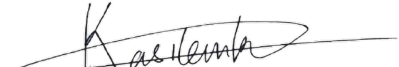
- Solid waste = 0.6kg/per person/day or (0.6kgx365 days)
- Waste generated per day = 0.6x 1420 = 852kg = 0.85 tonne
- Waste generated per annum = 0.85x365 = 311 tonne

## **11 CONCLUSION**

The proposed development will contribute towards improving the service delivery of the area and general livelihood of the residents.

**PROPOSED TOWNSHIP ESTABLISHMENT OF SITES ON REMAINDER OF  
PORTION 1 OF THE FARM NATURALLE LOKSASIEW 272 LS, TSHIKOTA EXT 3**

**BULK ENGINEERING SERVICES REPORT:  
CIVIL SERVICES REPORT**

Compiled by W. KASILEMBO  5/10/2021  
B. Tech Civil Signature Date

Reviewed by L. MTHUNZI  5/10/2021  
BSc Hons Eng, MSAICE, Pr Tech Eng Signature Date  
ECSA

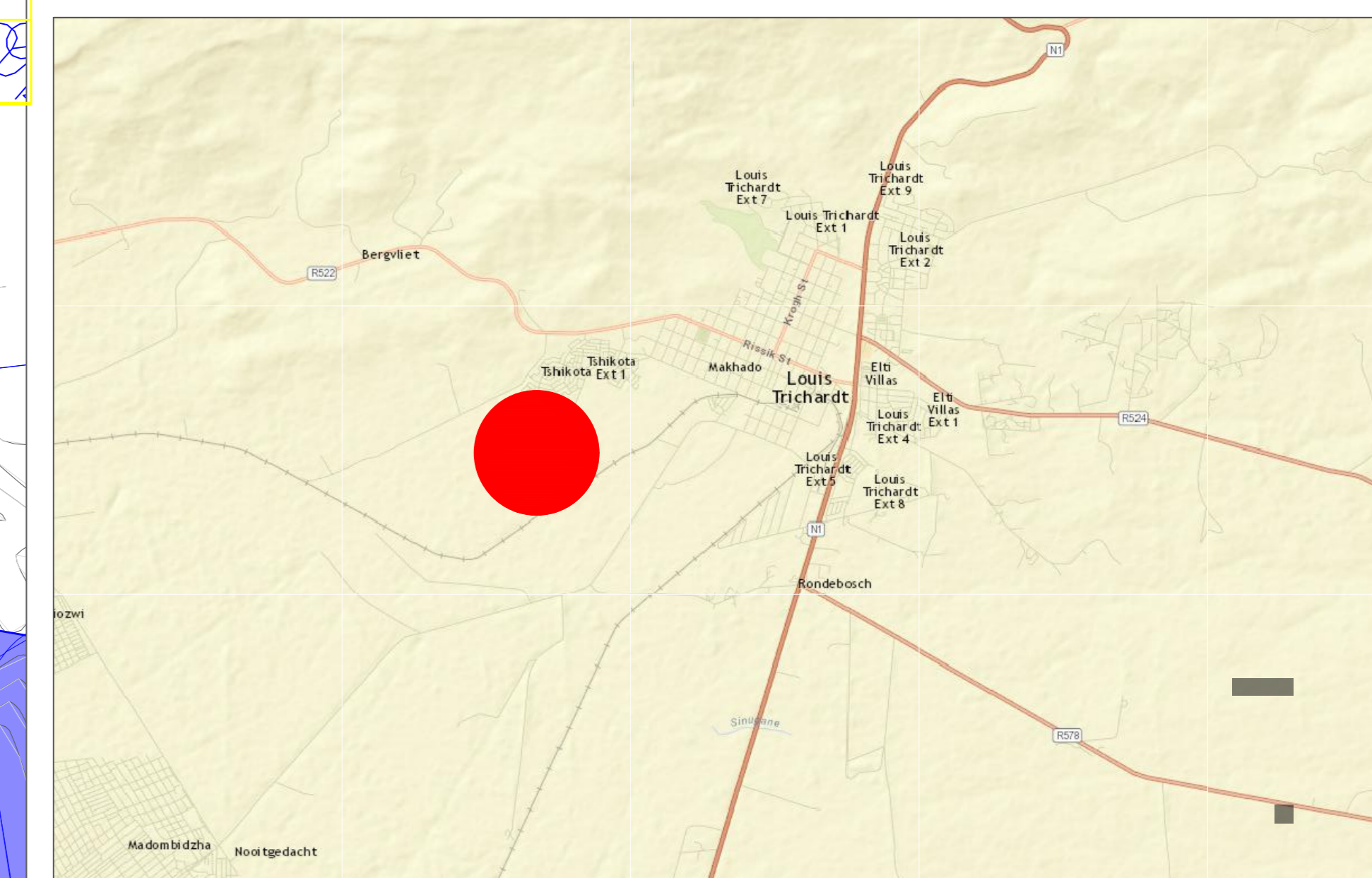
*For: DALIMEDE PROJECTS (Pty) Ltd.*

## ANNEXURES

## ANNEXURE 1 Layout Plan

# TOWNSHIP ESTABLISHMENT OF 350 SITES ON REMAINDER OF PORTION 1 OF THE FARM NATURALLE LOKSASIEW 272 LS, TSHIKOTA EXT.3

## MAKHADO LOCAL MUNICIPALITY

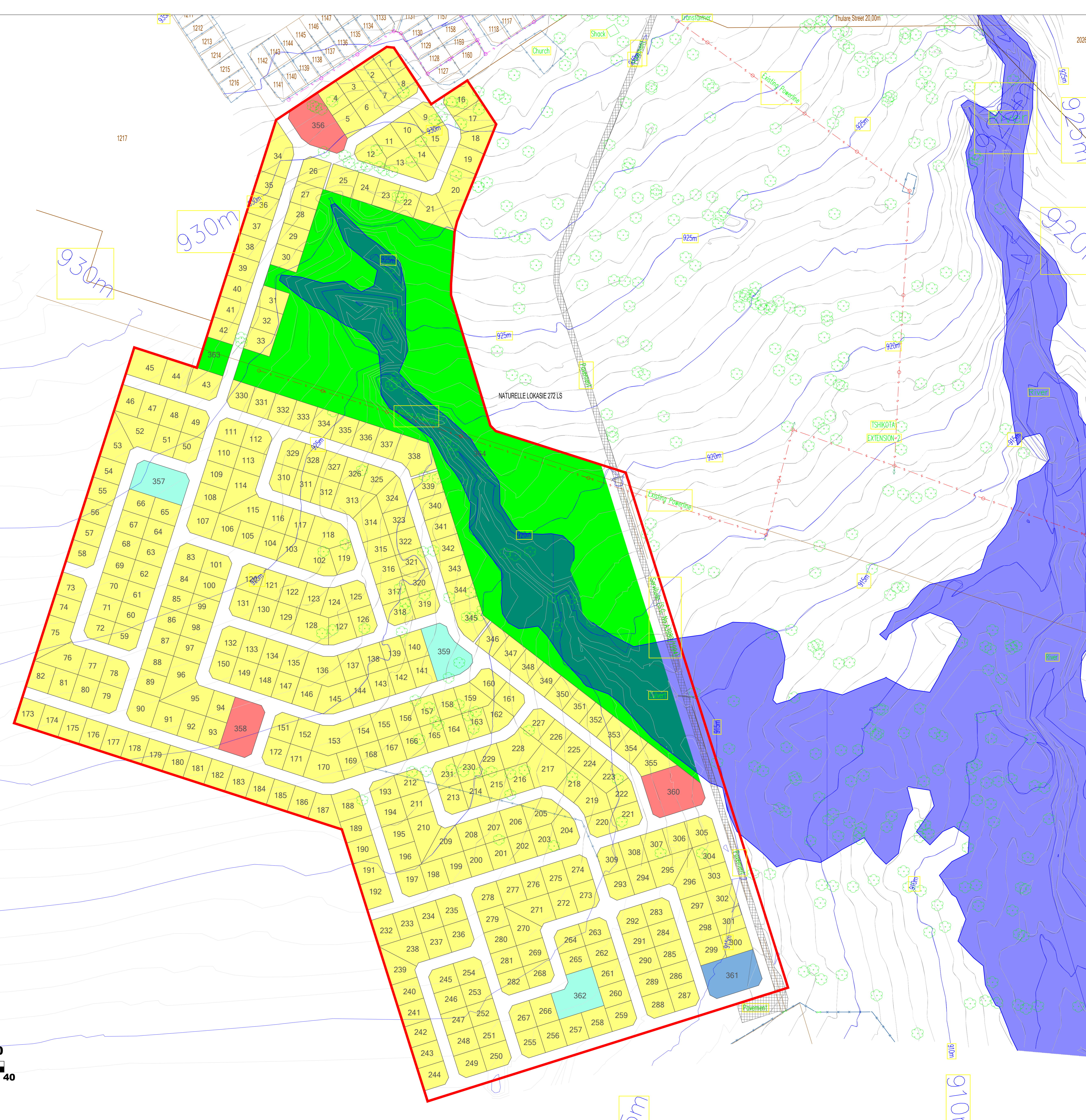


### LAND USE

ZONING	LAND USE	NO. OF STANDS	AREA Ha.	% OF AREA
RESIDENTIAL 1	RESIDENTIAL 900m2	355	19.314244	57.4527
BUSINESS 1	BUSINESS	3	0.502308	1.4942
INSTITUTIONAL	PLACE OF WORSHIP	1	0.162500	0.4834
EDUCATIONAL	CRECHE	3	0.42374874	1.260494
PUBLIC OPEN SPACE	PARK	2	6.8910717	20.4984
STREETS	*	*	6.323795	18.8109
TOTAL	*	364	33.6177	100

### LEGEND

MV ELECTRIC POWERLINE	
LV ELECTRIC POWERLINE	
CADASTRAL BOUNDARY	
FLOODLINE	
CONTOURS (1m)	
CONTOURS (5m)	
TREE	



SCALE BAR 1:200



#### FLOODLINE NOTE

IT IS HEREBY CERTIFIED IN TERMS OF ARTICLE 144 OF THE NATIONAL WATER ACT (ACT No. 36 OF 1998 THAT THE TOWNSHIP SHOWN ON THIS PLAN IS NOT AFFECTED BY FLOODLINES REPRESENTING THE MAXIMUM LEVEL LIKELY TO BE REACHED BY FLOODWATERS IN A DEFINED WATER COURSE ON AVERAGE ONCE IN EVERY 50 /100 YEARS.

#### GENERAL NOTES

- 1) CADASTRAL BOUNDARIES
- 2) GEODETIC SYSTEM WGS 84
- 3) ALL INTERNAL ROADS ARE 12M AND 16M WIDE UNLESS INDICATED OTHERWISE
- 4) ALL DIMENSIONS AND AREAS ARE APPROXIMATE & SUBJECT TO FINAL SURVEY BY PROFESSIONAL LAND SURVEYORS
- 5) BUILDING LINE ARE SUBJECT TO APPLICABLE SCHEME
- 6) ZONING ARE SUBJECT TO APPLICABLE ZONING SCHEME
- 7) CONTOUR NOTE: THE CONTOUR SURVEY IS IN ACCORDANCE WITH THE STANDARD LAID DOWN BY THE REGULATIONS RELATING TO TOWNSHIP ESTABLISHMENT AND LAND USE

#### DRAWING NOTES

DATE	2020/10/05
DRAWING NO	TSKEX3/04/2021
REVISION	2

TOWN PLANNER

FIRM:  
DATE:

LAND SURVEYOR

FIRM:  
DATE:

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**PROPOSED TOWNSHIP ESTABLISHMENT OF SITES ON REMAINDER  
OF PORTION 1 OF THE FARM NATURALLE LOKSASIEW 272 LS,  
TSHIKOTA EXT 3**

**ELECTRICAL SERVICES REPORT**

October 2021, REV 0

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## **1. EXECUTIVE SUMMARY**

The proposed township development situated on portion remainder of Portion 1 of the farm Naturelle Loksasie 272 LS; Tshikota Ext 3 is situated at Louis Trichard town. The area is administrated by Makhado Local Municipality under Vhembe District Municipality. The township consists of 364 stands. All the stands are yet to be electrified. There are existing MV feeder lines that are supplying the area. The MV line is Mink Conductor.

Industrial 22kV feeder is fed from Makhado main Substation. The current loading from Makhado Substation is 5MVA. It is recommended that the township can be connected. The construction will be constructed within the township connecting the distribution transformer.

## 2. INTRODUCTION

This report outlines the design philosophy of the electrical MV and LV installation for Portion 1 of the farm Naturelle Loksasie 272 LS, Tshikota Ext 3 to be established as a township. The installation will be designed to ensure that the installation will comply with the South African national safety standard while meeting the objective of the development.

ITEM	DESCRIPTION	COMMENTS
<b>1.</b>	<b>DEMOGRAPHIC INFORMATION</b>	
Town Layout	Number of stands	364
	Stand Density	Medium -16.5 hectare
	Town layout	Relatively Structured
	Classification of layout	Medium Density
Existing Infrastructure	Type of Road	Gravel
	Existence of Water Services	No
	Water reticulation	No
	Sewage infrastructure	No
	Others: Clinic	0
	Schools	0
	Churches	0
Businesses	0	
Site Conditions	Soil type	Red turf
	Climate	Temp: -5 to 30°C
	Population	Estimated 9 530 people
<b>2</b>	<b>NETWORK INFORMATION</b>	
2.1	Substation Source	Makhado main Substation

ITEM	DESCRIPTION	COMMENTS
2.2	Substation MV transformer capacity	5MVA/22kv
2.3	Feeder Name	Industrial 22Kv
2.4	MV CONDUCTOR TYRE AND SIZE	Fox
2.6	Voltage level at take-off point	95%

Table 1 Demographic information

### 3. DEVELOPMENT PROPOSAL (LOCALITY)

The site is situated 4km west of Louis Trichard town CDB along the Rassik street / road R522. Louis Trichard town is 100 kilometres north of Polokwane, situated along the N1 highway to Musina. The area is administered by the Makhado Local Municipality, in Vhembe District Municipality, Limpopo Province, South Africa. GPS coordinates of site are 23°3'17.96"S 29°52'33.26"E.

The locality map is shown on the figure below.



Figure 1 Locality

#### 4. EXISTING DESIGN PHILOSOPHY

##### 4.1 EXISTING MV RETICULATION

A site survey was conducted to determine the best and most economical means to provide power supply to site. There is an existing electrical infrastructure around Portion 1 of the farm Naturelle Loksasie 272 LS, Tshikota Ext 3. The township consists of 364 Stands. All the stands are yet to be electrified. There is an existing mv feeder lines that are supplying the area. The mv line is Fox Conductor. Industrial 22kV feeder is fed from Makhado main Substation. The current loading from Makhado substation is 5MVA.

Existing Transformer



Existing MV Feeder line



Figure 2 Existing Transformer and MV feeder line

## 5. DISTRIBUTION MODEL

The objective of this task is to develop an adequate network model representing the entire Portion 1 of the farm Naturelle Loksasie 272 LS up to 22kV main feeder level. The main feeder is defined as the main feeder supply from Makhado substation.



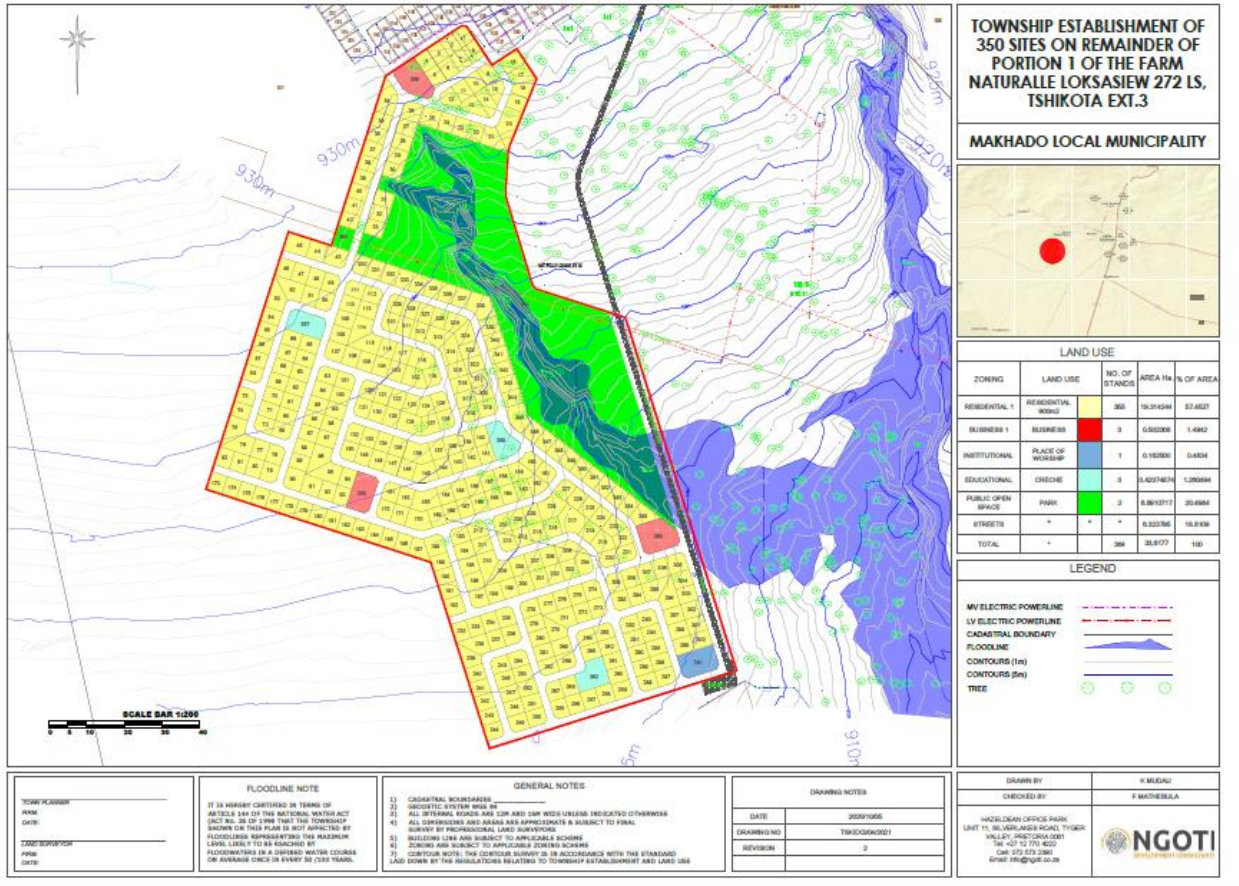


Figure 3 Proposed township development

## 6. SUPPLY AUTHORITY(LICENSED)

The area is situated within the electricity licensed area and supply by Municipality.

## 7. RETICULATION DESIGN

### 7.1 Method of supply

MV feeder will be constructed within the township and connected to the distribution transformer. MV feeder (22kV) will be taping from the existing MV feeder.

This is to determine the most cost-effective supply arrangement that is used and provide details of required in feed points. The following is included regarding to bulk supply:

- The planning capacity and bulk infrastructure.
- The quality of supply.
- Metering arrangement.
- Protection arrangement.
- The loss profile due to load.

## 7.2 Design Parameter

The Developer shall erect the MV and LV overhead line reticulation systems in accordance with Eskom’s Electrification Standards (Wood Structures). The internal MV distribution systems shall comprise of “Mink “aluminum conductor steel reinforced configuration on 11m or 9m wooden poles and shall be built to 22kV specifications.

The LV distribution systems shall comprise an aerial bundled conductor (ABC) system, of the supporting core type mounted overhead on either 7 or 9 meter wooden poles. LV distributor spurs shall extend within a radius of approximately 500m from transformer positions depending on individual voltage drop requirements. LV distributor spurs shall share pole structures with the MV system where these follow parallel routes providing clearance of LV can be achieved.

Transformers shall be of the pole mounted type suitably rated to serve anticipated individual LV distributor loads and shall be of the SABS 780 type. All materials supplied by the Developer shall conform to Eskom’s Buyer’s Guide (Part 9 of DT Standard).

## 7.3 Electrical Estimate.

Item	Description	Area (Ha)	Qty	VA/stand	Total
1	Residential 1	19.314244	355	1.2	426
2	Business	0.502308	3	1.2	3.6
3	Institutional (Place of worship)	0.162500	1	1.2	1.2
4	Education (Crèche)	0.42374874	3	1.2	3.6
5	Public open space (Park)	6.8910717	2	1.2	2.4
Total Load Demand					436.8

Table 2 Load Estimates

Total Maximum Load demand is 436.8kVA for 15years

The following design parameter is set:

- Medium voltage(Final Design)
  - ADMD 1.2kVA/stand
  - Spare capacity on feeder 0.5kVA/stand
  - Supply voltage 22kV-3 phase
  - Supply regulation(bulk) 100% (assumed)

The projected load for the final phase (at 1.2Kva per stand) is 361.2kVA. The transformer installed capacity is suitable for and can deliver an ADMD of 1.2kVA per stand.

- Low voltage(Final Design)
  - ADMD 0.65kVA/erf
  - Supply voltage 415 / 240 volt
  - Regulation +- 10%ase
  - Service connection(max) 20 Amp

#### CART Parameters:

ADMD	Alpha	Beta
Initial	0.28	1.69
Final	0.36	1.03

Table 3 Design parameter

#### 7.4 Summary of Predictions for each year.

Year	Energy (kWh)	ADMD (kVA)	Alpha	Beta	Circuit breaker (A)
1	150.70	0.69	0.47	8.91	
2	160.63	0.73	0.49	8.75	20.00
3	170.57	0.76	0.50	8.61	20.00
4	180.50	0.80	0.52	8.49	20.00
5	190.44	0.84	0.54	8.36	20.00
6	200.38	0.88	0.56	8.24	20.00
7	210.31	0.92	0.58	8.14	20.00
8	220.25	0.96	0.60	8.05	20.00
9	230.18	0.99	0.62	7.95	20.00
10	241.78	1.04	0.64	7.85	20.00
11	251.71	1.08	0.66	7.77	20.00
12	261.65	1.12	0.68	7.69	20.00
13	271.58	1.16	0.70	7.62	20.00
14	281.52	1.20	0.72	7.55	20.00
15	291.46	1.23	0.73	7.48	20.00

Table 4 Prediction for each year

## 7.5 MV Design

The existing and proposed medium-voltage network is best described in terms of both geographic layout and electrical connection layout. The performance of the network is quantified by MV load flow studies, based on the loads described in the load forecast.

Medium Voltage supply consists of three phase Mink conductor. The conductor shall be mounted on 9m wood poles and shall run street-front. A 780 pole mounted transformer shall be used to supply the stands. The transformer must not be loaded more than 108%.

All MV structures shall be constructed in accordance with Eskom Medium Voltage Distribution Standard and specifications.

The MV overhead feeder system shall comply with the requirements of Eskom's Distribution Technology, Electrification Standards and Guidelines as and where applicable for an urban concrete pole reticulation system.

### a) Conductor

Type	: Aluminium conductor steel reinforced.
Code Name	: Mink/Fox-see Bill of Quantities/drawings
Mass	: 85kg/km / 149kg/km
Ultimate tensile strength	: 7 900 / 13 200 Newton
Max working tension	: @ -5oC + wind 5 240 / 8760 Newton.
Mounting	: See structure codes on drawings.

The maximum working tension may be exceeded only during the construction stages when the conductors are to be "over-tensioned" to 1.05 x MWT for a period of not less than 8 hours nor longer than 24 hours after which the tension is to be reduced to a figure not to exceed the stated maximum working tension of the conductor concerned.

### b) Poles

Pole type	- Wood
Pole lengths	- 7m for LV distributor 9m for LV road crossing, 11m for MV Line
Planting depth	- 1.5, 1.8 and 2m respectively
Pole marker	- painted - black on yellow background.

### c) Stays

Type	- Fiber glass for MV and Porcelain of LV
Rods	- M20 - 2000 long
Base plate	- 380 x 380 x 6 galvanized
Stay wire	- 7/4mm, 1100 MPA - galvanized
Planting depth	- 2m

d) Flying Stays

Flying stays shall be installed in the positions indicated on the drawings by the structure codes. Anchor poles shall be as specified for the line structures and of sufficient length to ensure the required ground clearance. Overhead stay wire shall be 7/4.00mm as specified for stays.

e) Struts

Struts shall be installed in the positions indicated on the drawings by the structure codes. Strut poles shall be as specified for the line structures. Line structure poles shall be fitted with suitable ground anchors at all strut positions. Struts shall be fitted with barbed wire anti climbing devices.

f) Insulators, Line Clamps and Other Line Components, Pole Dressing Hardware etc.

All in accordance with Eskom's Distribution Reticulation Technology, Electrification Standards and Guidelines with particular reference to the detailed material take off sheets provided for the various line structures.

g) Sags and Tensions

The Developer shall provide suitable dynamometer sighting rods or other approved apparatus necessary for proper checking of the work. Dynamometers shall be calibrated in kg or kN.

h) Surge Arrestors

Surge arrestors shall be of the metal oxide outdoor hermetically sealed, vertical base mounted type, rated at 22kV, 10kA impulse current.

i) Sectionalizers

Dropout fuses shall be provided for each transformer zone.

## 7.6 Pole Mounted Transformers

Transformers shall generally comply with the following details:

Situation	:	Outdoors
Mounting (outline)	:	Suitable for single pole structure (Transformer outline)
Type	:	SABS 780
kVA rating	:	100/50 (as indicated on drawings)

No load voltage ratio : 22000/415/231 volt  
Vector group : Dyn 11  
Parallel operation : Not required  
MV & LV connections : External bushings with suitable insulated connections.

The transformers shall be connected on the MV side through the use of links/or fuses as indicated on the drawings.

## **7.7 LV Design**

The low voltage feeders shall be three phase 4 core aerial bundle conductor with bare neutral and shall be 70 and 35mm<sup>2</sup>. The LV network is to be constructed in mid block layout on 7m wood poles. The feeders shall be fused at the transformer pole. All LV structures shall be constructed in accordance with Eskom Low Voltage Distribution Standard and specifications.

## **7.8 Service connection**

The majority of customers are expected to purchase a 20 Amp supply. Service connections are to be made with a 4mm<sup>2</sup> concentric cables from a 4-way and 8-way distribution pole top boxes. The service connection shall be a concentric cable in accordance with SCSSCAAC7. For a 60A supply a 10mm<sup>2</sup> concentric cables shall be used. The concentric cable used on all new services shall be installed without joints from the pole-top distribution box into the standard passive unit base, which is mounted in the customer's premises.

Where the concentric cable enters the dwelling, suitable protection shall be applied around the cable to prevent damage to the insulation. The concentric cable shall form a "drip loop" before the attachment or entry point on the customer's wall as illustrated in drawings D-DT-0360 and D-DT-0361. The concentric cable entry point into the SPU shall be watertight.

The SPU consists of a standard dispenser socket (ED base) attached to a standard 110 mm x 110 mm socket outlet box as illustrated in D-DT-0347. The SPU shall be installed in every customer's home regardless of the type of supply required. For customers with a 60A supply the standard 110mm X 110mm socket outlet box shall be removed from the SPU. The SPU shall comply with SCSSCAAJ1.

The SPU integrates the incoming service cable with the metering, protection and household distribution. It provides the separation of the earth and neutral for the customer's installation. The wiring between the standard dispenser terminals and the socket outlet box is part of the customer's installation. The wiring shall be done with a separate earth and neutral wire.

The SPU shall be mounted at a position that is suitable for the customer and away from sources of heat and moisture. Refer to 7.9 in SABS 0142 for the positioning of distribution boards. On brick walls, a 6mm diameter "easy-drive" with screw (D-DT-3149) will be used to mount the SPU. In all other cases, a threaded rod with washers shall be used. A non-metallic cable gland (D-DT-3070) will be provided at the service cable entry point to the standard passive unit.

All services shall be in accordance with Eskom Distribution Services Standard and specifications.

## **8. MATERIAL AND EQUIPMENT SPECIFICATION.**

The Developer will erect the MV and LV overhead line reticulation systems in accordance with Eskom's Electrification Standards (Wood Structures). The internal MV distribution systems shall comprise of "Fox" aluminum conductor steel reinforced configuration on 12m, 11m or 9m wooden poles and shall be built to 11kV specifications.

The LV distribution systems shall comprise an aerial bundled conductor (ABC) system, of the supporting core type mounted overhead on either 7 or 9 meter wooden poles. LV distributor spurs shall extend within a radius of approximately 500m from transformer positions depending on individual voltage drop requirements. LV distributor spurs shall share pole structures with the MV system where these follow parallel routes providing clearance of LV can be achieved.

Transformers shall be of the pole mounted type suitably rated to serve anticipated individual LV distributor loads and shall be of the SABS 780 type. All materials supplied by the Developer shall conform to Eskom's Buyer's Guide (Part 9 of DT Standard).

## 9. EARTHING AND LIGHTNING PROTECTION SYSTEM

In accordance with Eskom Distribution Standard Part 2, with particular reference to:

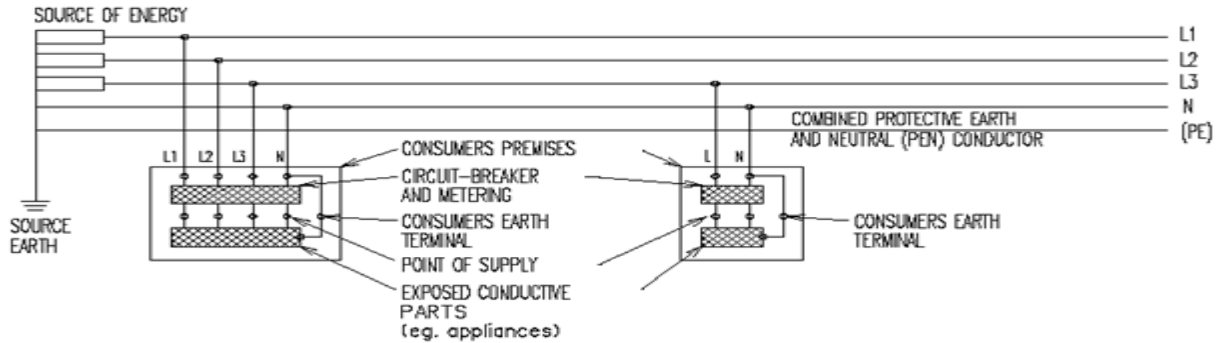


Figure 4 Consumer Schematic

Results of soil resistivity survey at 2 points.

Min Cu area : 16mm<sup>2</sup> stranded  
12mm<sup>2</sup> solid

- Low Voltage  
22 kV systems : 70 Ohms
- Medium Voltage  
22kV system : 30 Ohms

## 10. RECOMMENDATION

MV feeder network that supply the township feeder is Industrial 22kV and Substation name is Makhado main Substation. Makhado substation is currently loading 5MVA. MV line is fox conductor. It is recommended that the township can be connected from the existing network. Implementation network must be installing according to Eskom distribution network standard.






**SOCIO-ECONOMIC IMPACT ASSESSMENT**

**FOR THE PROPOSED TOWNSHIP ESTABLISHMENT OF 500 SITES ON  
REMAINDER OF PORTION 1 OF THE FARM NATURALLE LOKSASIEW 272 LS  
WITHIN MAKHADO LOCAL MUNICIPALITY, LIMPOPO PROVINCE**

**JULY 2021**




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**DEGREE OF CONFIDENTIALITY**

Report Title	<p><b>SOCIO-ECONOMIC IMPACT ASSESSMENT FOR THE PROPOSED TOWNSHIP ESTABLISHMENT OF 500 SITES AT TSHIKOTA LOCATION ON PORTION 1 FARM NATURALE LOKASIE 272 LS WITHIN MAKHADO LOCAL MUNICIPALITY, LIMPOPO PROVINCE</b></p> 
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## 1. INTRODUCTION AND BACKGROUND

The access to land was racially determined in the past government dispensation which was apartheid government. The minority white population owned and had access to the vast majority of the land while the black majority population was relegated to ethnically-based 'homelands' or dormitory townships on the outskirts of cities and towns. This spatial segregation was enforced through a host of repressive legislation including the Natives Land Act 27 of 1913, Group Areas (Act No. 41 of 1950) and the Prevention of Illegal Squatting Act (Act No. 52 of 1951). Furthermore, the socio-economics of apartheid meant that, in general terms, white people lived in formal houses or flats, whereas black people lived in huts, shacks or rudimentary township houses. Tshikota Township is one of the formations of the old apartheid government, which isolated black community from access to economic activities and located them in the outskirt of Louis Trichardt (Makhado Town).

The South African Government has been struggling to address the land and housing backlog, the current delivery rate shows that it will take more than 20 years to address the housing backlog. More people need land and housing because of increasing urbanisation, including population growth and in-migration (urban and rural migration). If we do not directly confront these challenges, unauthorised land occupations and the development of new informal settlements will increase. Therefore, it will be difficult to achieve the progressive realisation of the right to land and housing as found in the Constitution of South Africa.

**Great Warthog Geo-Environmental** have been appointed by **Ngoti Development Consultants** to undertake a Socio-Economic Impact Assessment (SEIA) study, to assess the socio-economic impacts associated with the proposed Township Establishment at Tshikota Township Ext 3 that is situated within Makhado Local Municipality (MLM) of Vhembe District, Limpopo Province.

### 1.1 Project Description

Makhado Local Municipality intends to establish a Township of 500 sites on Portion 1 of the farm Naturelle Lokasie 272 LS. The purpose is to follow all processes of establishing a township at Tshikota Ext 3. As shown in table 1 below, the proposed township will incorporate various land uses including residential site, business, educational and public open spaces; the township will cover an area of 33.6177 ha.

Table 1: Land use

LAND USE				
ZONING	LAND USE	NO OF STANDS	AREA (HA)	% OF AREA
Residential 1	Residential	355	19.314244	57.4527
Business 1	Business	3	0.502308	1.4942
Institutional	Place of Worship	1	0.162500	0.4834
Educational	Crèche	3	0.4237874	1.260494
Public open space	Park	2	6.8910717	2.9709
Streets	*	*	6.8910717	18.8109
<b>TOTAL</b>	<b>*</b>	<b>364</b>	<b>33.6177</b>	<b>100</b>

## 1.2 LOCATION OF STUDY AREA

The proposed Township Establishment is located at Tshikota Ext2 on the on portion 1 of the farm Naturelle Lokasie 272 LS. Tshikota Township is an R293 formal township located in the central part of MLM under Vhembe District, Limpopo Province. Vhembe District is located in the far North of Limpopo Province. Makhado Municipality is strategically located as a gateway along a major passage between South Africa and the rest of the African continent. Tshikota Township is locate approximately 5km from the Makhado Town Central Business District (CBD) on the West of the town, Table 2 gives the detailed description of the location including Figure 1 that shows the location of the proposed site.

Table 2: Property details

PROPERTY DETAILS					
FARM NAME	FARM NO	PORTION NO	EXTENT (Ha)	WARD NO	LOCAL MUNICIPALITY
Naturalle Loksasie	272 LS	1	33.6177	7	Makhado Local Municipality



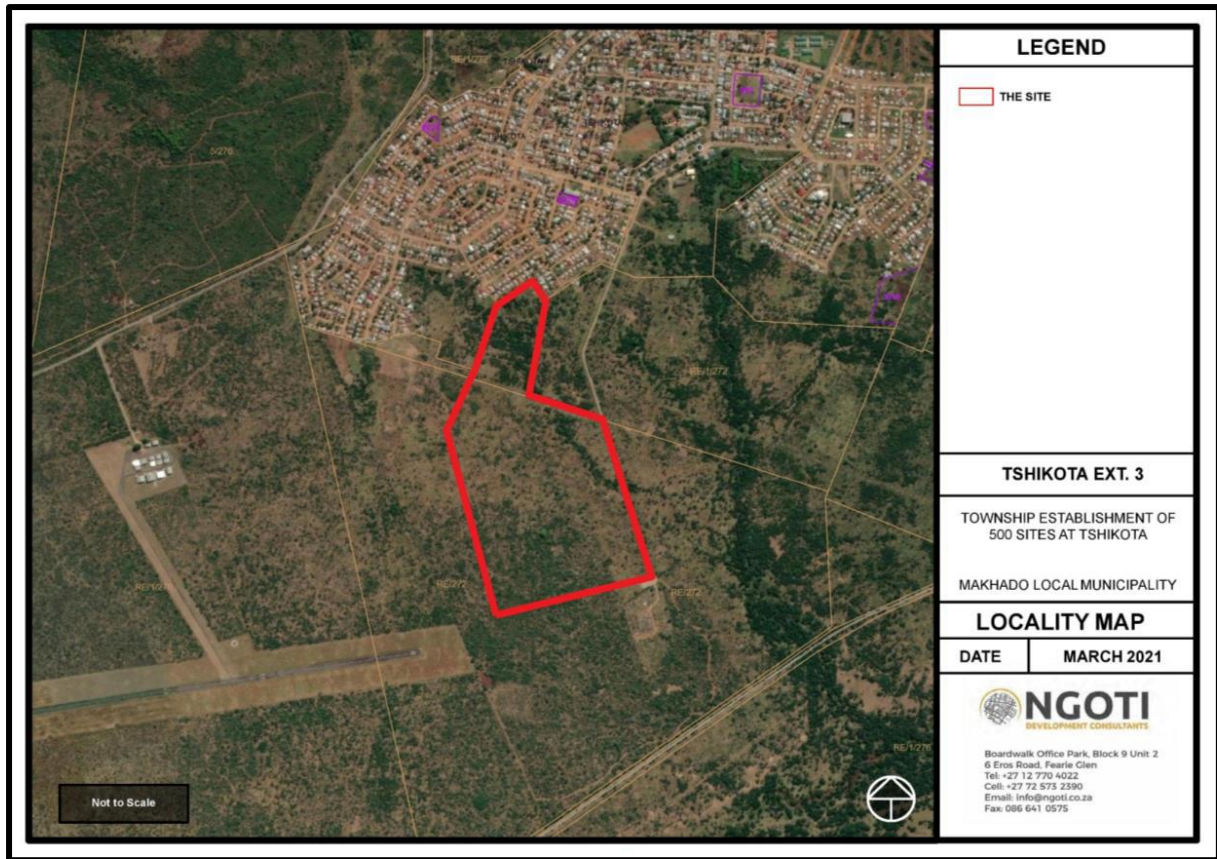


Figure 1: Locality Map

## 2. SCOPE OF WORK AND STUDY OBJECTIVES

### 2.1 Scope of Work

The scope of the report includes an identification and description of the study area and the identification of anticipated social and economic impacts associated with the township establishment.

### 2.2 Study Objectives

The purpose of this study is to investigate and present the results of the Socio-Economic Impact Assessment of the proposed Township Establishment. The Socio-Economic Impact Assessment forms part of the Environmental Impact Assessment process prescribed by the National Environmental Management Act, (Act 107 of 1998).

The study aims to:

- Assess the current socio-economic status of the area and the social characteristics of the receiving environment;

- Indicate the anticipated core impact categories and impact areas (possible hot spots);
- Identify anticipated positive socio-economic impacts of the proposed project, and provide enhancement measures for these impacts;
- Identify and analyse negative socio-economic impacts (social hot spots) of the proposed project and indicate mitigation strategies to deal with these impacts; and
- Present the findings, recommendations, and conclusions of the Socio-Economic Impact Assessment.

### **3. METHOD AND APPROACH OF THE STUDY**

A Socio-Economic Impact Assessment (SEIA) study characterised by two dominant methods, which are participatory or a technical methodology. Each of these methodologies will be briefly explained for clarity purposes as follows.

A participatory methodology comprises of the information and local knowledge of the people who form a part of the social environment in question. It is enabled in such a way that the SEIA specialist gathers information pertaining to the possible respective impacts from the affected parties. Therefore, the function of the specialist in this form of methodology is to enable and encourage people to impart knowledge and perceptions, and for it to be considered in the study.

Technical methodology focus on the observations of the social environment as well as scientific information as the base of reporting. It involved the use of the specialists' choice of indicators that will contribute and enlighten decision maker/authorities in relation to the manner in which the socio-economic environment would alter.

This study has employed a technical methodology, in this regard, the core elements that are representative of the process, are the collection and assessment of the project based on secondary data, where the following was undertaken.

#### **i) Literature Review**

Existing data was reviewed that included, but not limited to, the revised MLM Integrated Development Plan (IDP), Spatial Development Framework (SDF), and online information that could serve as valuable information for the project. This literature review was carried to establish a base of information that largely formed the baseline information of this SEIA.

## ii) Collection of Primary Data

Primary data is information that is collected that can be considered “first hand” information. It often features in this context as observation and interviews that are obtained by fieldwork, all of which have informed this report. The fieldwork was undertaken on 1 – 2 June 2021, a site walk and brief engagements with member of Tshikota community was done.

## iii) Collection of Secondary Data

The secondary data refers to the information collected from the literature review and is connected to any literature that is not collected as primary data.

## iv) Data Analysis

Data collected is interpreted and interpolated in order to form informed holistic and conclusive evidence based assessments which will be carried forward into the impact assessment and recommendations sections of the report.

## v) Impact Assessment and Analysis

The potential impacts that were identified are rated according to the significance criteria and method stipulated in section 5.

## 4. BASELINE PROFILE

This section examines the key socio-economic characteristics of the study area. The section is essential as it provides both qualitative and quantitative data relevant to the communities and economies under observation, creating a baseline that will then assist in identifying the sensitive receptors and potential impacts.

The following socio-economic indicators are analysed in this section as follows:

- Demographic profiling
- Spatial composition and land-use
- Economic structure
- Employment status
- Infrastructure status

## 4.1 Study Area's Composition

### 4.1.1 Spatial Context and Regional Linkages

The proposed Township Establishment is situated under ward 7 of the Makhado Local Municipality, which is one of the municipalities making up the Vhembe District Municipality in the Limpopo Province.

The Limpopo Province is located on the Northern part of South Africa, this province has an estimated total population of 5,8 million, which increased by 400 000 in 2016 from 5.4 million in 2011 census, making it the fifth largest province in the country in terms of population size. Limpopo Province shares borders with Botswana, Zimbabwe and Mozambique. The province is known for bushveld and wildlife reserves, including part of Kruger National Park. West of the Kruger are the craggy Blouberg mountains and Makgabeng Plateau with ancient rock art.

Vhembe District is located in the Northern part of Limpopo Province. It shares boarders with Capricorn and Mopani District Municipalities in the Eastern and Western directions respectively. The sharing of boarders extends to Zimbabwe in the north and Botswana in the North-West and Mozambique in the South-East through the Kruger National Park respectively. The District covers 27 969 148 km<sup>2</sup> of land.

The district has the total population of 1 393 949 people according to Stats SA, 2016 Community Survey. Out of the total population of the district, Makhado has 416 728, Thulamela with 497 237, Collins Chabane Local Municipality with 347 974 and Musina with 132 009.

Makhado Municipality is located in the northern parts of Limpopo Province approximately 100km from the Zimbabwean border along the N1 Route. The municipal area is 760506 Hectares in size and strategically located on a macro scale along a major passage between South Africa and the rest of the African continent. Approximately 416 728 people currently reside within the Municipality and based on the vastness of the rural populace the municipality can be classified as predominately rural.

### 4.1.2 Major Towns and Settlements

The proposed Township Establishment is located within Tshikota Township of MLM; Tshikota is an R293 Township of MLM. The closest major town to the project area is Makhado town, which is approximately 5km West from the project area. Makhado town is a major town within MLM and within Vhembe District.

#### 4.1.3 Resources and land capability

The project area is located within a virgin land with evidence of old agricultural activities, on the South of project area is Tshikota community cemetery and on the north is the main Tshikota Township. The proposed Township Establishment complements the Municipality spatial framework to development and expand Tshikota Township is mainly for residential purpose. The proposed project will therefore not pose any land use conflict.

### 4.2 Demographic Profile

The population of any geographic area is the cornerstone of the development process, as it affects the economic growth through provision of labour and determines the demand for the production output. Examining population dynamics is essential in gaining an accurate perspective of those who are likely to be affected by any likely prospective development or project. This sub-section describes the status quo of the project area's demographics at its most accurate state.

#### 4.2.1 Population Size

Makhado local Municipality is a home to 416 728 people counted in the community survey of 2016, the population has decreased from 516 031 counted in the 2011 census. The population decline is due to the new demarcation of the municipal boundaries. The Municipality has a population density of 54.7 people per square kilometre, with 116 369 households. The project area is within ward 16 of MLM and has a population of 9781, which contributes just 2% of the total population of MLM. Ward 7, which includes Tshikota Township and the study area, is a home to 14228; the figures of population size is shown in Figure 2 below.

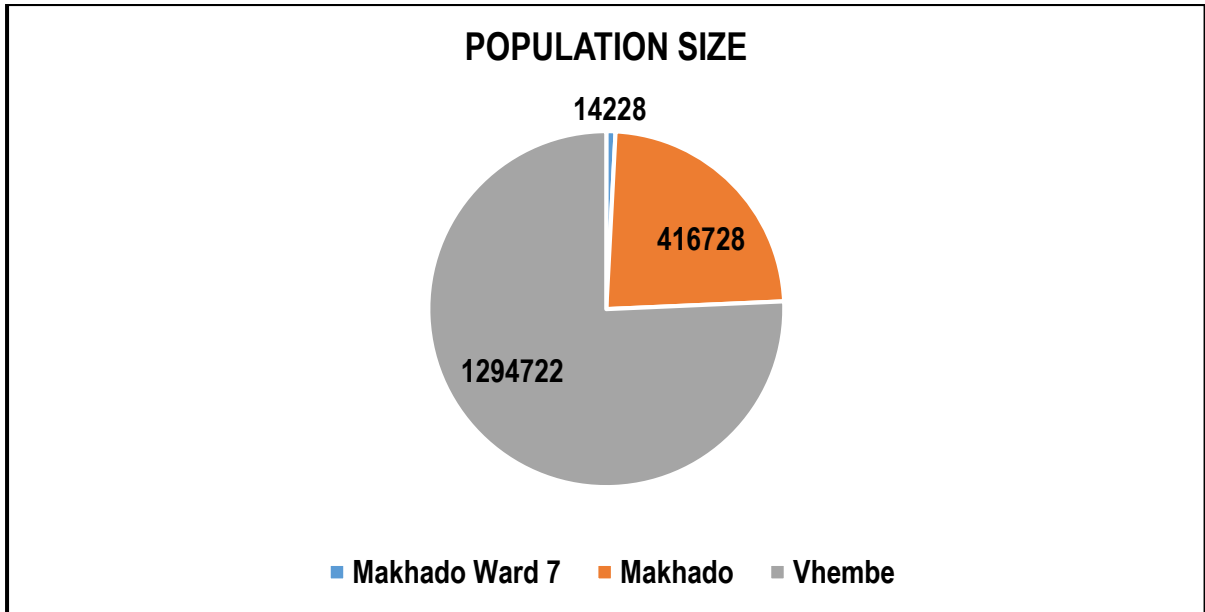


Figure 2: Population Size (2016 community survey)

#### 4.2.2 Race, Gender and Language

The population of MLM is made of 97.7% of Black/African population which amount to 406 970, followed by coloureds with 1104 people making 6,3%, then white with 1,7% amount to 6931 and Indian/Asian with a total of 1723 making a 0,4% of the MLM population.

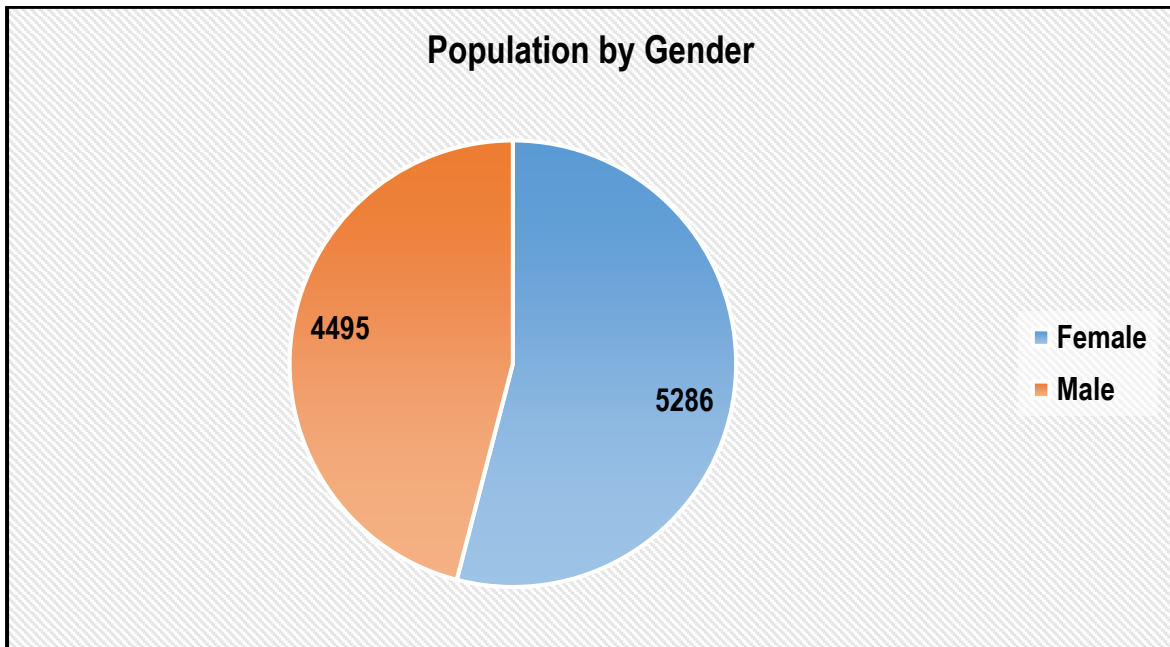


Figure 3: Population by Gender

The 53.6% of the population in MLM is female and just 46.4% of the population is male. As shown in the figure above, the project area has majority population as females with 5286 (54%), males in the project area account for 4495 (46%).

Figure 4: Population by Race Group

The majority of the people residing in the municipality speaks Tshivenda as their first language. A total of 312 915 people in the Municipality speaks Tshivenda followed by 65 561 Xitsonga speaking people. The two languages dominate the Municipality as per the community survey of 2016.

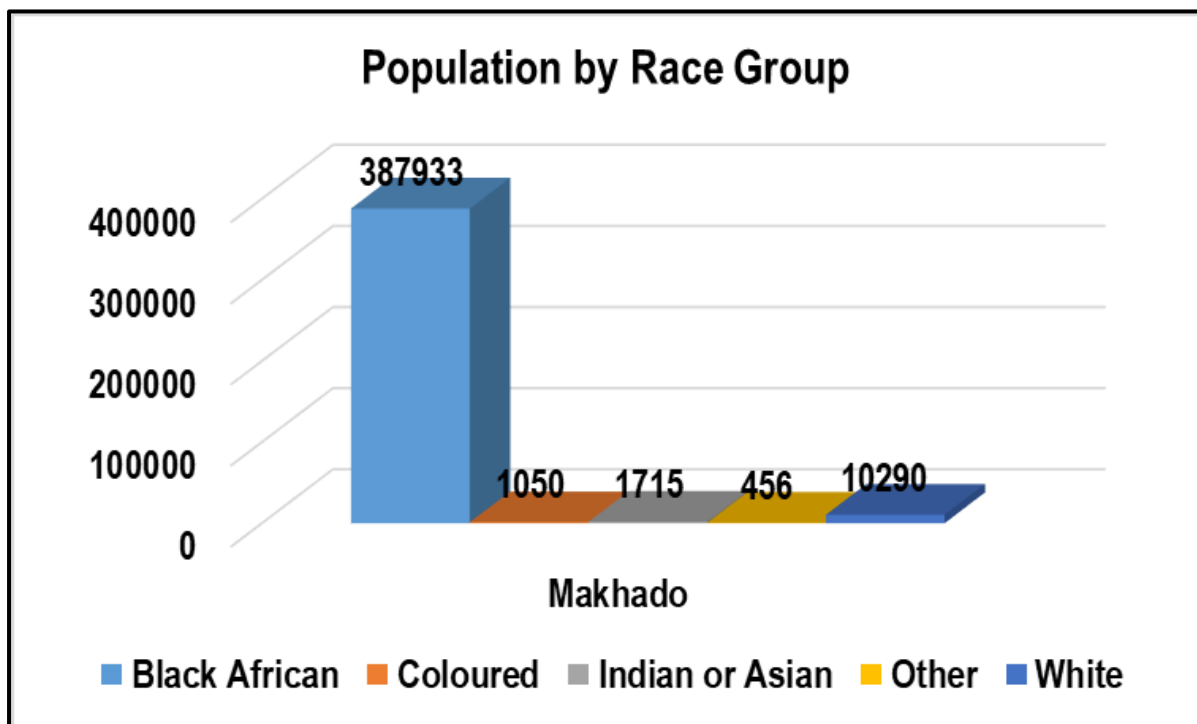


Figure 5: Population by Primary Language

#### 4.2.3 Age Profile

The age profile of MLM shows that the municipality is youthful and predominately the youth are found in the MLM. According to the 2016 Community survey the MLM has 183 318 young people from 0 – 18 years group followed by the 210 952 of age group 19 – 64 years which makes 50.6% of the municipality and only 5.4% of the municipality is elderly group from the age of 65 years and above.

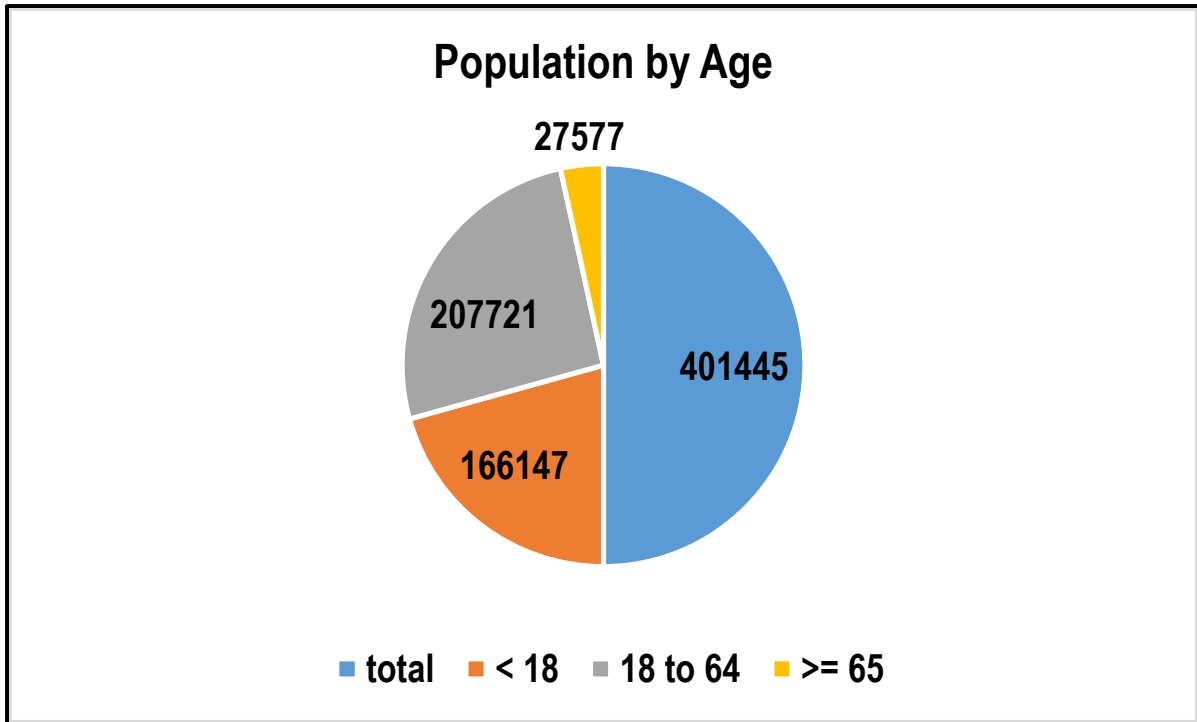


Figure 6: Population by Age

#### 4.2.4 Education Profile

The demographics of MLM shows that 63.9% of the population has completed Grade or higher, this average rate is less than the district rate of 65.98% and the Provincial rate of 66.65%. The MLM has only 33.5% of its population with matric (grade 12), this rate is approximately equivalent with the district of level of 34.32% and the Province with 34.86%. The population of MLM has only 6% of which has post matric qualification, including undergraduate qualifications and post graduate qualification.

### 4.3 Basic Service delivery

#### 4.3.1 Health Care Services

The majority of the population within the MLM is reliant on the state to provide health care support. This just highlights the need to provide an integrated and efficient public health system across the spheres of government.

However there are forty-four (44) public clinics and seven (7) mobile clinics that serve the municipality. There are three (3) public hospitals in MLM and only one (1) private hospital. The prevalence of HIV/Aids remains a huge concern which requires various interventions to combat the challenge. It will remain one



of the key factors that will continue to influence development over the next few decades. The chart below (Figure 7) shows the number of health care facilities within MLM.

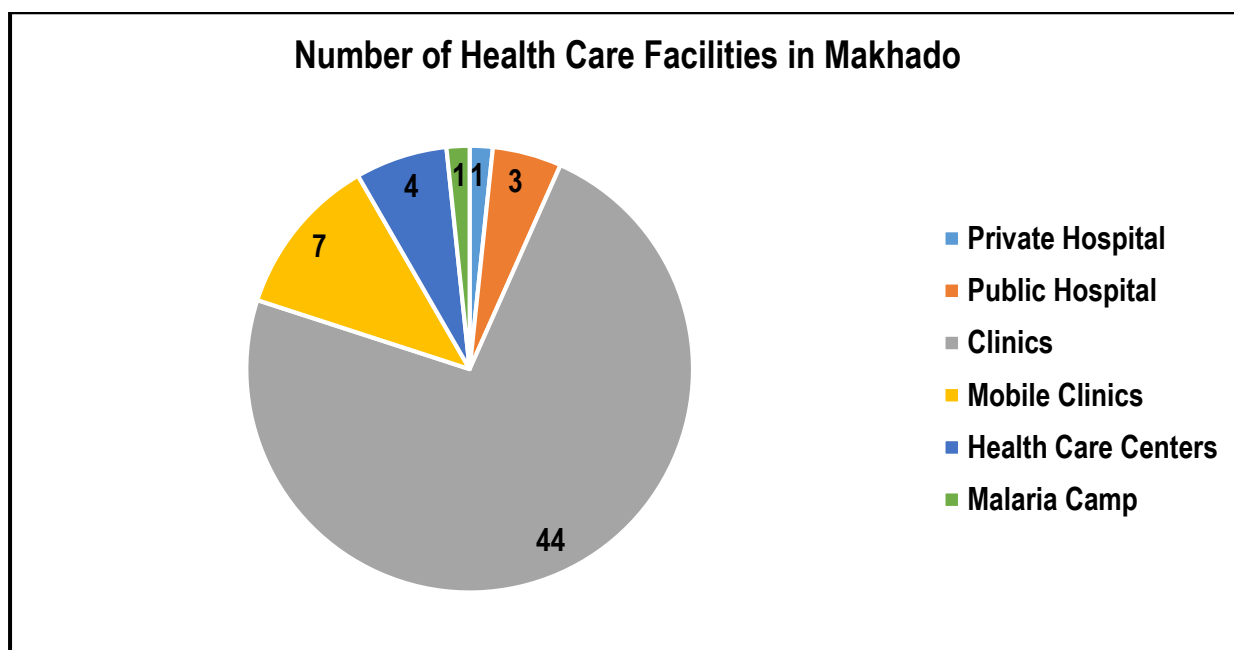


Figure 7: Number of health care facilities in MLM

#### 4.3.2 Water Connections

Vhembe District municipality is the water service authority and service provider (WSA and WSP). The data presented in Table 3 below reflects piped water services by group of households within Makhado Municipality. The table also shows that a total number of **17 668** households (backlog) are below the required water provision distance of less than 200m from the dwelling as per the required standards.

Table 3: Municipality, piped water by group of head of the household

WATER CONNECTION TYPE	HOUSEHOLDS
Piped (tap) water inside dwelling/institution	21 119
Piped (tap) water inside yard	37 511
Piped (tap) water on community stand: distance less than 200m from dwelling/institution	35 623
Piped (tap) water on community stand: distance between 200m and 500m dwelling/institution	12 805
Piped (tap) water on community stand: distance 500m and 1000m from dwelling/institution	6 710

Piped (tap) water on community stand: distance greater than 1000m from dwelling/institution	3 452
No access to piped (tap) water	17 668

#### 4.3.3 Electricity Provision

According to the MLM IDP (2020/21), about 6756 households are without electricity and the municipality has a Free Basic Electricity policy targeted at poor households. Free 50 Kilowatts units of electricity are given to the indigent households on a monthly basis. An indigent register of households earning less than R1 880 per month and/or are unemployed is kept and updated annually. About 28 212 indigent households in both Eskom and the Municipal licensed areas are receiving free basic electricity. It must also be noted that the Municipality had not reach the 2014 National Electrification target given its MTEF allocation.

#### 4.3.3 Housing

The MLM has a total of 106739 houses, the majority of houses within the project area are (Houses or brick/concrete block structure on a separate stand or yard or on a farm). As shown in Table 4 below there is also a greater proportion of informal dwellings with 3279 categorised as informal dwellings including; shack in backyard and shack not in a backyard.

The type of dwelling within MLM shows the area as rural Municipality due to rural settlement pattern and types of dwellings.

Table 4: Makhado Municipality Type of Dwelling

Type of dwelling	No
Traditional dwelling/hut/structure made of traditional materials	3735
Semi- detached house	406
Room/flatlet on a property or larger dwelling/servants quarters/granny flat	318
Informal dwelling (shack; not in backyard; e.g. in an informal/squatter settlement or on a farm)	1646
Informal dwelling (shack; in backyard)	1633
House or brick/concrete block structure on a separate stand or yard or on a farm	95321
House/flat/room in backyard	609
Flat or apartment in a block of flats	556
Cluster house in complex	175
Caravan/tent	134

The 2016 community survey shows that 76% of the household within MLM are fully owned or have been paid off, this is mainly due to that the MLM is mainly characterised by rural settlements.

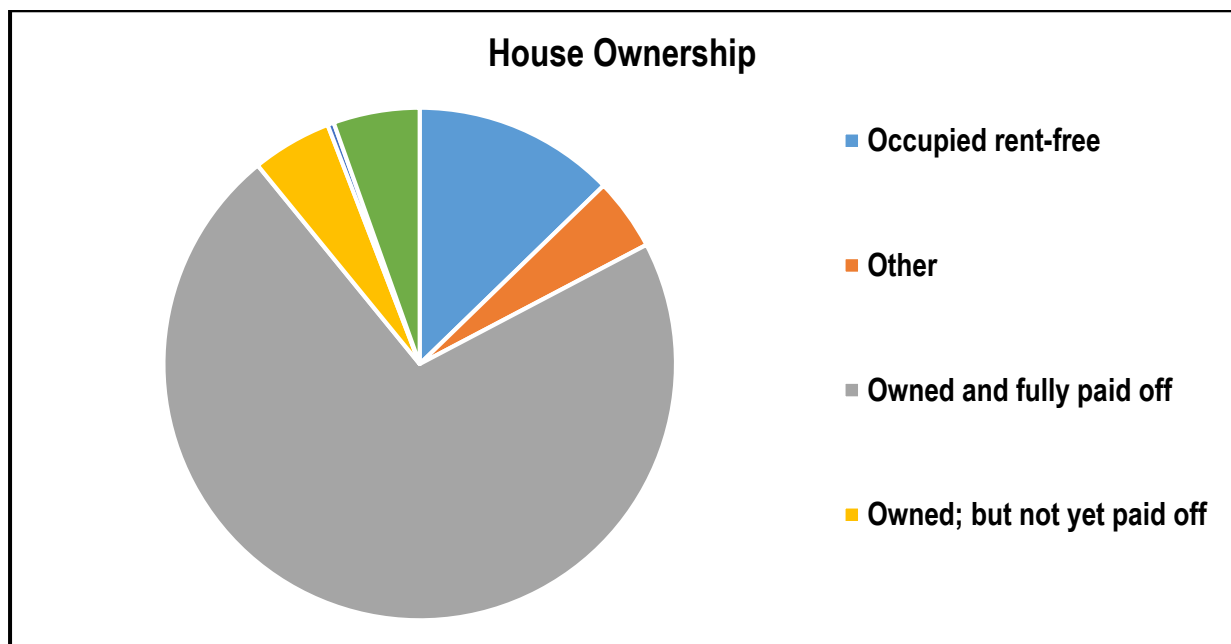


Figure 8: Household ownership

The Figure 8 above shows that majority of the household are fully owned by the occupants/residents, there is also high number of those occupying households and are rent free. Within the only a small proportion of the residents that have not fully paid their households.

#### 4.4 Economic Profile

The Figure 9 below shows that dominant economic sector within MLM is general government, which contributes about 27.37% of the GVA of the Municipality. The General Government employs about 14.35% of the MLM population. The municipality's economic growth potential is in agriculture and ecotourism. Most of the people derive their livelihood through agricultural pursuits. The main occupation sector is agriculture (commercial and subsistence farming). With the unemployment at 36,7%, there is a great dependency on pension and social grants.

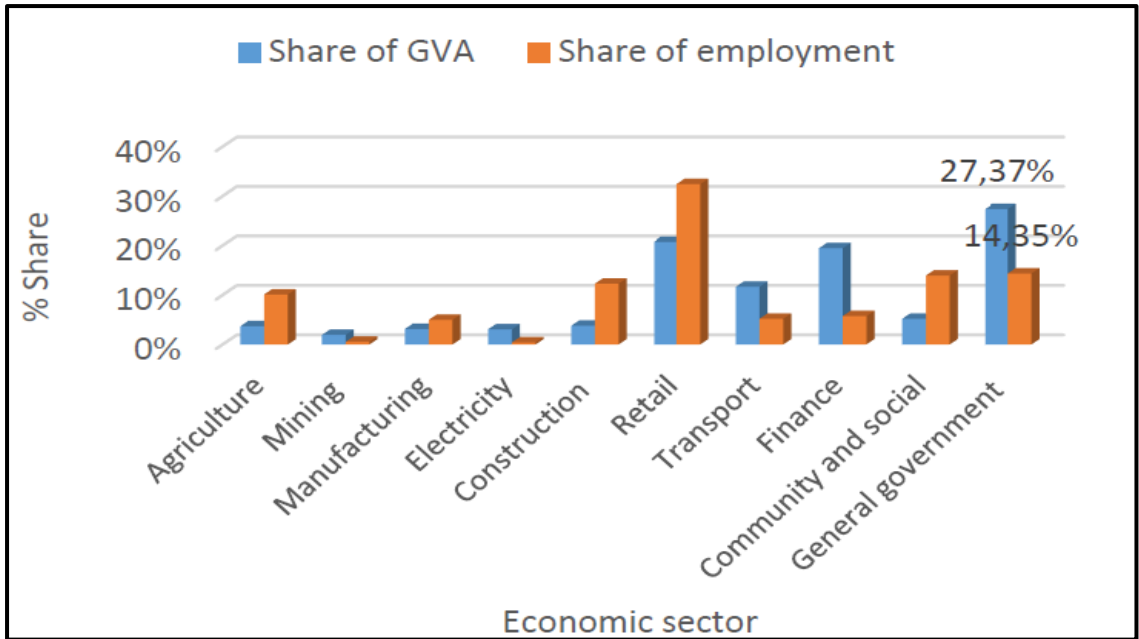


Figure 9: Economic strength

#### 4.4.1 Employment Profile

The Figure 10 below shows that only 29% of the population within MLM is employed, vast majority of the population is not economic active with 49%. The unemployed and those discouraged to seek for employment make up 7% of the study area, the unemployment rate within the project area is way below the national unemployment rate.

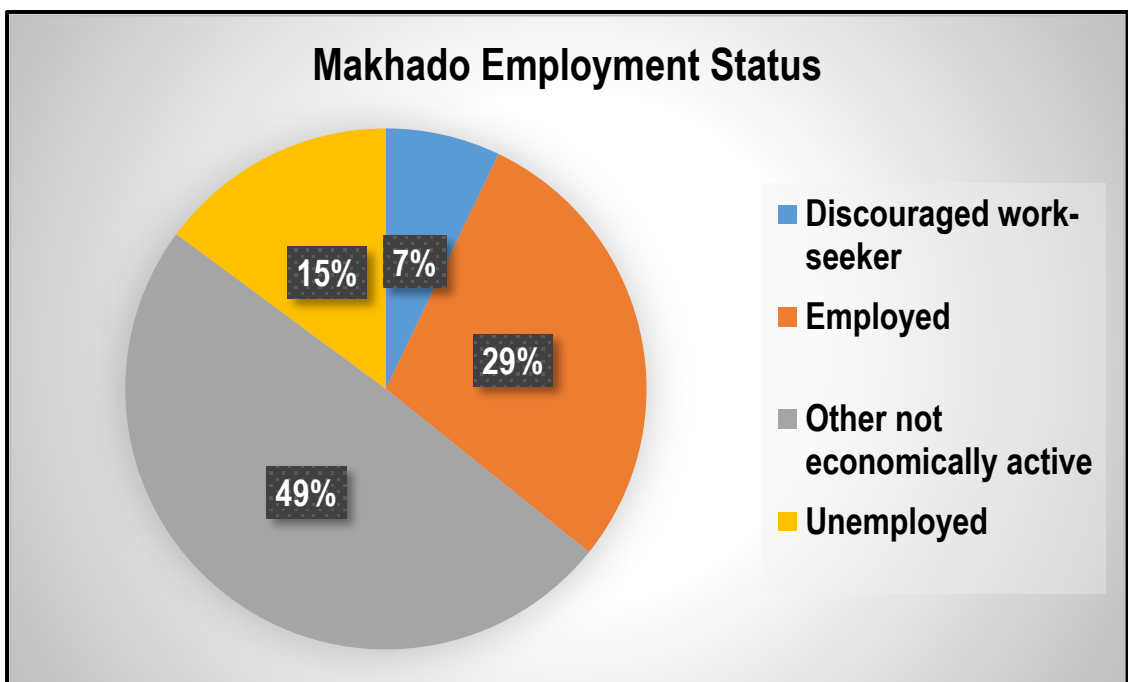


Figure 10: Makhado Municipality Population by employment

#### 4.4.2 Household Income

The Figure 11 below shows that majority of household within the MLM have an annual income ranging between (R 76 801 – 153 600) and (19 201 – R 38 400), according to the annual household income it shows that vast majority within MLM are living within the poverty. The high number of household with low annual income can be attributed to the available working opportunities within the municipality which mainly is the government services sector.

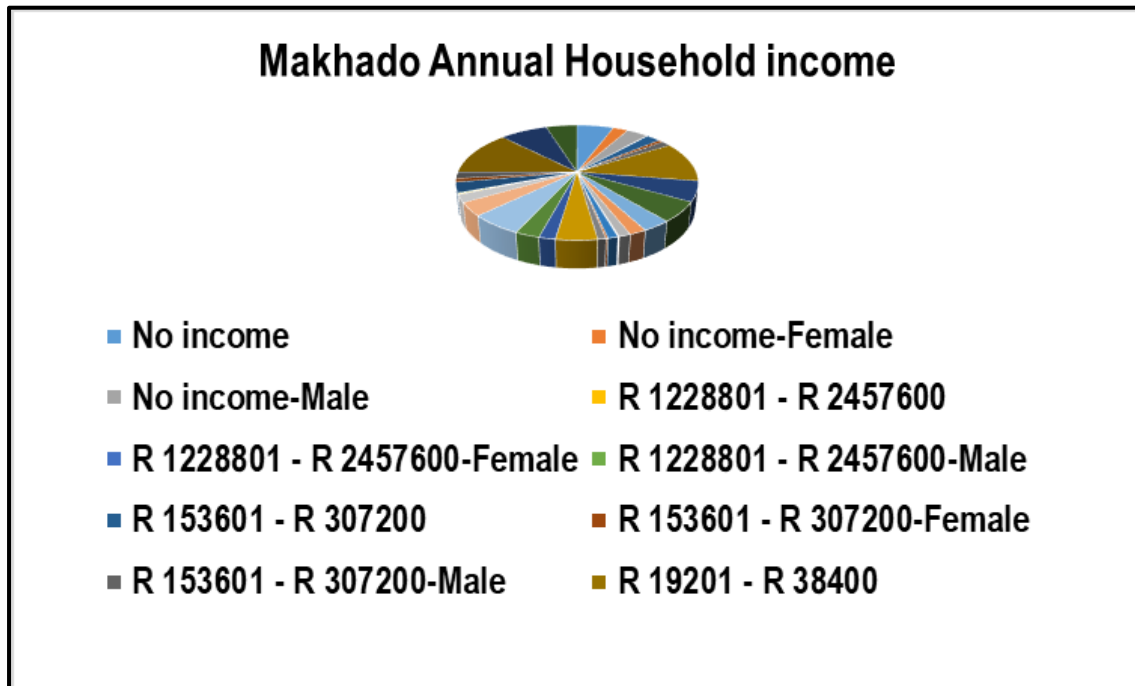


Figure 11: MLM Household Annual income

## 5. ASSESSMENT OF POTENTIAL IMPACTS

An **impact** can be defined as any change in the physical-chemical, biological, cultural and/or socio-economic environmental system that can be attributed to human activities related to alternatives under study for meeting a project need. The significance of the aspects / impacts of the process will be rated by using a matrix derived from Plomp (2004) and adapted to some extent to fit this process. These matrices use the consequence and the likelihood of the different aspects and associated impacts to determine the significance of the impacts.

Socio-Economic impact assessment (SEIA) is the study of the way in which the direct benefits and costs of a proposed project affect the local, regional, or national social and economy. Economic impacts refer to the effects on the level of economic activity in a given area because of some form of external

intervention in the economy. The intervention can be in a form of new investment in infrastructure, new development, or adoption of a new policy or services. These interventions subsequently have a diverse effect on economic environment.

### 5.1 Impact Assessment Criteria

The criteria for assessing impacts is shown in Table 5 below, the table shows the rating level and description of each impact item for assessing the significance.

Table 5: Impact Assessment Criteria

DESCRIPTIVE CRITERIA		
NATURE	CATEGORY	
EXTENT (E)	1	Site/Project Area
	2	Local surrounding areas
	3	Regional
	4	National
	5	International
DURATION (D)	1	Short (Few days/ a week – a month)
	2	Short (Few Months – a year)
	3	Medium (a few years)
	4	Long (life span of development)
	5	Permanent
INTENSITY (I)	1	Very low-natural process not affect (project not disturbed)
	2	Low-natural process slightly affected (project partially affected)
	3	Medium-natural process modified (project changed/modified)
	4	High-natural process are modified significantly
	5	Very high-natural process disturbed significantly (project stop temporarily <sup>1</sup> or permanent)
PROBABILITY (P)	1	Improbable (less than 25% of occurring)
	2	Probable (25 – 49% of occurring)
	3	Likely (50 – 69% of occurring)

	4	Very Likely ( 70 – 89% of occurring)
	5	Definite (90 – 100% of occurring)
<b>SIGNIFANCE</b>	Significance= (E + D + I) x P Minimum Score = 3 Maximum Score = 55	
	<10	Low – Low consequence, probability not an issue as positive, <b>No Mitigation required</b>
	10 - 20	Medium – Medium consequence, probable, <b>mitigation is advised</b>
	20 – 30	High – High consequence, probable to very probable, <b>mitigation is necessary</b>
	31 – 40	Very High - Very high consequence, probable/definite, <b>mitigation is essential</b>
	41>	Extremely High – Extremely high consequence, definite, <b>Fatal flaw</b>
	+ Ve	The impact is considered Positive
	-Ve	The impacts is considered Negative

## 5.2 Potential Project Impacts

This section presents a list of potential social and economic impacts that will be come with the proposed Township Establishment in both construction and operational phase of the project.

Table 6: Impacts and Recommended Mitigation Measures

IMPACT	CONSTRUCTION PHASE	OPERATIONAL PHASE
Positive Impacts (+Ve)	<ul style="list-style-type: none"> <li>• Skilled and unskilled employment opportunities</li> <li>• Business Opportunities</li> <li>• Improved local economy</li> <li>• Skills development</li> </ul>	<ul style="list-style-type: none"> <li>• Decent housing for Tshikota's residents;</li> <li>• Broaden the rates base for the local municipality;</li> <li>• Creation of cumulative and long term employment and business opportunities</li> </ul>

<p>Negative Impacts  (-Ve)</p>	<ul style="list-style-type: none"> <li>• Influx of job seekers</li> <li>• Increased criminal activities</li> <li>• Community riots</li> <li>• Safety and security</li> </ul>	<ul style="list-style-type: none"> <li>• Pressure capacity of existing services;</li> <li>• Reduction in property values</li> </ul>
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### 5.3 Impact Assessment Rating

This section presents the significance rating of the potential impacts, the mitigation measures for all negative (-ve) impacts are outlined and the enhancement measures for all positive (+ve) impacts are outlined.

Table 7: Impact significance rating and mitigation measures

ASPECT	MITIGATION MEASURES	EXTENT	DURATION	INTENSITY	PROBABILITY	SIGNIFICANCE
<b>CONSTRUCTION PHASE OF TSHIKOTA EXT 3 NEW TOWNSHIP</b>						
Influx of job seekers around the project area and surrounding community	Without mitigation measures	2	4	3	4	36 (-ve)
	With mitigation measures	2	3	3	3	24 (-ve)
Mitigation Measures	<ul style="list-style-type: none"> <li>MLM must liaise with the Tshikota community leaders to monitor and identify potential problems that may arise due to the influx of job seekers to the area. a register of complaints must be maintained throughout the construction phase of the project;</li> <li>The security and safety of the local family structures, businesses and social networks must be upheld at all times by implementing work plans that determine worker's movement, work times and access;</li> <li>Implement a policy that no employment will be available at the gate. This should be linked to the establishment of an employment office at Tshikota and at the MLM. The employment of locals must be of paramount importance.</li> </ul>					
Creation of Job opportunities	Without enhancement measures	2	4	4	4	40 (+ve)
	With enhancement measures	3	4	5	5	58 (+ve)

<p>Enhancement measures</p>	<ul style="list-style-type: none"> <li>• Each phase of the life of project will create employment and business opportunities from design, procurement, site establishment, construction, commissioning and maintenance. These opportunities will last for the same duration as the project stage at which individuals benefit, however, the transfer of skills will be a lifelong benefit for the beneficiaries of the requisite skills acquired;</li> <li>• Where reasonable and practical the contractors appointed by the proponent should appoint local contractors and implement a 'locals first' policy, especially for semi and low-skilled job categories;</li> <li>• Where feasible, efforts should be made to employ local contractors that are compliant with Broad-based Black Economic Empowerment (BBBEE) criteria;</li> <li>• Before the construction phase commences the proponent should meet with representatives from the KHLM to establish the existence of a skills database for the area. If such a database exists, it should be made available to the contractors appointed for the construction phase;</li> <li>• The local authorities, community representatives, and organisations on the interested and affected party database should be informed of the final decision regarding the project and the potential job opportunities for locals and the employment procedures that the proponent intends following for the construction phase;</li> <li>• Where feasible, training and skills development programmes for locals should be initiated prior to the initiation of the construction phase;</li> <li>• The recruitment selection process should seek to promote gender equality and the employment of women wherever possible;</li> <li>• The proponent should seek to develop a database of local companies, specifically BBBEE companies, which qualify as potential service providers (e.g. construction companies, catering companies, waste collection companies, security companies etc.) prior to the commencement of the tender process for construction contractors. These companies should be notified of the tender process and invited to bid for project-related work;</li> </ul>
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	<ul style="list-style-type: none"> <li>the proponent, i.e. MLM must liaise with the Tshikota Community Leaders, and representatives from the local Chamber of Commerce and hospitality industry to identify strategies aimed at maximising the potential benefits associated with the project.</li> </ul>					
Threat to safety and security of the	Without mitigation measures	2	3	4	4	36 (-ve)
	With mitigation measures	2	2	3	3	21 (-ve)
Mitigation measures	<ul style="list-style-type: none"> <li>The proponent should appoint an Environmental Control Officer (ECO) to monitor the construction phase and ensure that all conditions in the licences/permits/authorisations are adhered to and the recommended mitigation measures are implemented;</li> <li>The proponent and the contractors should, develop a Code of Conduct for the construction phase. The code should identify what types of behaviour and activities by construction workers are not permitted. Construction workers that breach the code of good conduct should be disciplined. All disciplinary measures must comply with the South African labour legislation;</li> <li>The movement of construction workers on and off the site should be closely managed and monitored by the contractors. In this regard the contractors should be responsible for ensuring that construction workers respect the rights of the residents of Sutherland and do not pose a safety and security threat to the residents and their families.</li> </ul>					
Increase in criminal activities and spread of STD's	Without mitigation measures	2	3	3	4	32 (-ve)
	With mitigation measures	2	2	3	3	21 (-ve)
	<ul style="list-style-type: none"> <li>The contractor must make necessary arrangements to enable workers from outside the area to return home over weekends and or on a regular basis during the construction phase. This would reduce the risk posed by non-local construction workers to local family structures and social networks;</li> <li>The contractor must make the necessary arrangements for ensuring that all non-local construction workers are transported back to their place of residence once the construction phase is completed. This would reduce</li> </ul>					

	<p>the risk posed by non-local construction workers to local family structures and social networks;</p> <ul style="list-style-type: none"> <li>• The contractors must, develop a Code of Conduct for the construction phase. The code should identify what types of behaviour and activities by construction workers are not permitted. Construction workers that breach the code of good conduct should be disciplined. All disciplinary measures must comply with the South African labour legislation;</li> <li>• The contractor should implement an HIV/AIDS awareness programme for all construction workers at the outset of the construction phase;</li> <li>• The movement of construction workers on and off the site should be closely managed and monitored by the contractors. In this regard the contractors should be responsible for ensuring that construction workers respect the rights to the residents of Sutherland and do not pose safety and security threat to the residents and their families;</li> </ul>					
<b>OPERATION PHASE OF TSHIKOTA EXT2 TOWNSHIP</b>						
Decent accommodation for Tshikota township residents	Without enhancement measures	2	3	4	4	36 (+ve)
	With enhancement measures	3	3	4	5	50 (+ve)
Enhancement measures	<ul style="list-style-type: none"> <li>• A screening process and register of the beneficiaries of the low cost houses must be kept and maintained to avoid residents from renting out the properties to others and other acts of maleficence.</li> <li>• The contractors that will be commissioned by the proponent to construct and service the proposed area for development must be well vetted to ensure quality infrastructure is installed e.g. building contractor must meet the requirements as stipulated by the National Home Builders Registration Council (NHBRC);</li> <li>• The development of the proposed low-cost houses should, first and foremost, benefit the current inhabitants of Sutherland who reside in squalor conditions;</li> </ul>					

	<ul style="list-style-type: none"> <li>The provision of services i.e. sanitation, electricity, waste collection will assist in an improvement in the quality of life of the inhabitants of Tshikota.</li> </ul>					
Broaden the rates base for the local municipality	Without enhance measures	2	3	3	4	36 (+ve)
	With enhancement measures	2	4	4	5	50 (+ve)
Enhancement measures	<ul style="list-style-type: none"> <li>The establishment of new township will broaden the rates base of the MLM, which will translate to a benefit for the local area. With proper management , a broader rates base and increased revenue from water and electricity should assist the MLM to address other developmental issues as they pertain to Tshikota township.</li> </ul>					
Cumulative and long term employment and business opportunities	Without enhance measures	2	3	4	4	36 (+ve)
	With enhancement measures	3	3	5	5	55 (+ve)
Enhancement measures	<ul style="list-style-type: none"> <li>The establishment of the new township will assist with creation of potential long-term employment opportunities in relation to road maintenance, sanitation and bulk water supply (maintenance of pipelines), security, street lighting, etc.</li> </ul>					
Pressure on capacity of existing services	Without mitigation measures	2	3	4	4	36 (-ve)
	With mitigation measures	2	2	3	3	21 (-ve)
Mitigation measures	<ul style="list-style-type: none"> <li>The possible influx of residence who come from Tshikota and the surrounding will pose a challenge on the efficient dissemination of services such as schooling, health, water and sanitation and security. An</li> </ul>					

	<p>increase in the populace that will need to benefit from these services may put additional strain on services provision as there will be more people to cater for in schools and clinics and will create a lopsided ratio in ems of number of police officers per number of citizens;</p> <ul style="list-style-type: none"> <li>• In addition, an influx of residence will create further completion for the already scarce employment opportunities within Tshikota community.</li> </ul>					
Reduction in property values of adjacent land	Without mitigation measures	2	3	4	5	45 (-ve)
	With mitigation measures	2	2	3	3	21 (-ve)

## 5.4 Impact Statement

The overall finding of the SEIA is that the magnitude and significance of the potential socio-economic impacts associated with the establishment of new Township at Tshikota ext 3 project outweigh the potential negative socio-economic impacts. It is therefore recommended that the development as proposed be supported by the competent authorities, subject to the implementation of the recommended enhancement and mitigation measures put forth in this report.

## 6. CONCLUSION AND RECOMMENDATIONS

This report presented the results of the socio-economic impact assessment of the establishment of new Township at Tshikota ext2. The following section seeks to summarise, interpret and provide recommendations based on the desktop assessment and impact results.

### 6.1 Key Findings

The key findings of the study are summarised under the following sections:

- Whether or not the proposed development ties in with key policy and planning requirements
- Anticipated impacts associated with the Construction Phase
- Anticipated impacts associated with the Operational Phase

#### 6.1.1 Policy and Planning

The key documents reviewed included:

- National Development Plan-2030
- Makhado Local Municipality IDP (2019-2020);
- Makhado Local Municipality Spatial Planning, Land Development and Land Use Management By-Law (2016)
- Makhado Municipality Property Rates By Law (2020/21)
- Makhado Municipality Spatial Development Framework (2011)

The findings of the review indicated that the allocation of demarcation and identification of encroachments supports the principles and objectives set out in the IDP and the Municipality Land Development and Land Use Management By-Law. The proposed development also supports the objectives set out in South Africa's National Development Plan (NDP-2030) and the MLM Spatial Development Plan, specifically the creation of employment and economic development opportunities

### 6.2 Recommendations

From this section, it is evident that the development will result in economic growth of the local economy and decrease the unemployment numbers of the Tshikota and the surrounding community. This will further result in the community being able to obtain jobs (mostly during construction) and in return be able



to earn an income, which would then place the community in a position to be able to provide for their basic needs.

In order to ensure that the positive impacts of the proposed development are maximised and any negative impacts reduced, specific management strategies and mechanisms need to be incorporated into the overall township establishment. The following considerations need to be considered as a way forward:

i) Labour contracts

The aim of a labour contract is to ensure that economic benefits from the proposed development are given, as far as possible, to local communities. This contract should pertain to the specific employment of local labour where possible. It is recommended that the contractors appointed during the construction phase of the project should have a contractual agreement with the developer. The contractors should therefore provide the developer with an indication of the percentage of labourers which will be sourced locally. The employment contract criteria should include the following:

- Determine the percentage of local labourers to be employed;
- Future employees should provide the employer with a proof of residence to ensure that they are from the local area (if they do not have a municipal account etc. they need to provide other proof such as a letter from someone that they live with who do own a house etc. that they are permanently staying at that address. These documents need to be certified affidavits as well;
- Where possible, unemployed labourers' must be procured;
- Implement contract stipulations.
- Emphasis should be made in respect to those conditions that pertain to the general security and safety of individuals living adjacent to the proposed developmental area;
- Monitor that stipulations are implemented correctly.

ii) Workplace skills plan

It is recommended that the developer should have a labour desk in the area aiming to liaise with the community and linking skills provided by the community with skills required by the construction contractors. Different types of skills are required for the different phases of the projects. Various specialised skills will also be required and this will present job opportunities. The following actions should be taken:

- The developer should engage with local authorities and business organisations to investigate the possibility of procurement of construction materials, goods, and products from local suppliers where feasible.
- The operator of the proposed project should be encouraged to procure materials, goods and products required for the operation of the facility from local suppliers to increase the positive impact in the local economy as far as possible.
- Sub-contract to local construction companies where possible.
- Use local suppliers where feasible and arrange with the local Small and Medium Enterprises to provide transport, catering, and other services to the construction crew.

iii) Rules and regulations

Additional actions that can be taken include:

- Appoint a well-qualified Environmental Control Officer to ensure enforcement and compliance to all the licence/permit/authorisation conditions;
- Control the movement of workers between the site and areas of residence to minimise loitering around the proposed facility by providing scheduled transportation services between the urban areas and the construction site;
- Engage communities with respect to their possible involvement during construction in providing supporting services such as catering, temporary housing for workers, transportation, etc;
- Establish a proper fencing around the property to reduce the risk of workers trespassing between the construction site and adjacent properties;
- Set up a gate and controlled access system to monitor the movement of people to and from the property, as well as to reduce the influx of job seekers to the site itself;
- Ensure that any damages or losses to the nearby properties that can be linked to the conduct of the construction workers are adequately reimbursed;
- Assign a person to deal with complaints and concerns of the affected parties;
- Engage with local authorities and inform them of the development as well discuss with them the ability of the municipality to meet the demands for social and basic services created by the migrant construction workers;
- Where feasible, assist the municipality in ensuring that the quality of the local social and economic infrastructure does not deteriorate making use of the social responsibility allocations.

### 6.3 Conclusion

In order to ensure that the positive impacts of the proposed development are maximised and any negative impacts reduced, specific management strategies and mechanisms need to be incorporated into the overall development. The municipality must consider a community consultation, awareness of the by-laws to the local residents within the project area and the surrounding.

In conclusion, the right to land is a nexus right, encompassing so much more than stand/plot, there is an on-going discussions relating to the Section 25 of National Constitution that relates to the land. The residential land requires guidance for development and provision of adequate services by the Municipality.

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3. Makhado Local Municipality IDP (2019-2020);
4. Makhado Local Municipality Spatial Planning, Land Development and Land Use Management By-Law (2016)
5. Makhado Municipality Property Rates By Law (2020/21)
6. Makhado Municipality Spatial Development Framework (2011)
7. National Development Plan-2030
8. The right to housing in South Africa, Jackie Dugard with Michael Clark, Kate Tissington and Stuart Wilson, 2016

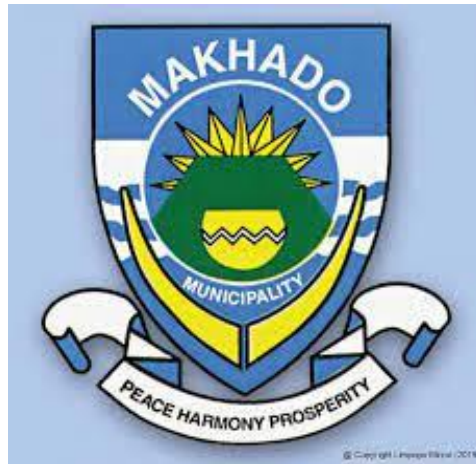
## Appendix F – Environmental Management Programme

**ENVIRONMENTAL MANAGEMENT PLAN FOR THE PROPOSED TOWNSHIP  
ESTABLISHMENT ON PORTION 1 OF THE FARM NATURELLE LOKASIE 272-LS,  
MAKHADO LOCAL MUNICIPALITY IN LIMPOPO PROVINCE**

REF NO: 12/1/9/2-V128

NOVEMBER 2021

**PREPARED FOR:**  
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**ENVIRONMENTAL MANAGEMENT PLAN FOR THE PROPOSED TOWNSHIP ESTABLISHMENT ON  
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**November 2021**

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## ENVIRONMENTAL ASSESSMENT PRACTITIONER DECLARATION

I **Phakwago M. Kabelo** in my capacity as an Environmental Assessment Practitioner, hereby declare that I-

- Act as an independent consultant;
- Do not have any financial interest in the undertaking of the activity, other than remuneration for the work performed in terms of the National Environmental Management Act, 1998 (Act 107 of 1998);
- As a registered member of the South African Council for Natural Scientific Professions, will undertake our profession in accordance with the Code of Conduct of the Council, as well as any other societies to which we are members; and
- Based on information provided to us by the project proponent, and in addition to information obtained during this study, have presented the results and conclusion within the associated document to the best of our professional judgement.



## **APPENDICES:**

Appendix A – Environmental Code of Conduct

Appendix B – Environmental Complaints Registers

Appendix C – Environmental Incidents Registers

Appendix D – Environmental Training Register

Annexure E – EA / ROD

Appendix F – Details and Expertise of the EAP



## ACRONYMS AND ABBREVIATIONS

Limpopo Department of Economic Development, Environment and Tourism	(LEDET)
Department of Energy	(DE)
Environmental Management Programme/ Plan	(EMPR)
Independent Environmental Auditor	(IEA)
Environmental Control Officer	(ECO)
Environmental Consultant	(EC)
Environmental Assessment Practitioner	(EAP)

### Definitions

#### *Construction:*

Construction means the building, erection or establishment of a facility, structure or infrastructure that is necessary for the undertaking of a listed or specified activity but excludes any modification, alteration or expansion of such a facility, structure or infrastructure and excluding the reconstruction of the same facility in the same location, with the same capacity and footprint.

#### *Disturbance:*

Any event or series of events that disrupts ecosystem, community, or population structure and changes resources, substrate availability, or the physical environment.

#### *Earth Works:*

This involves construction machinery, dampening and general preparation of the site for construction purposes.

#### *Environmental Incident:*

- Any action undertaken (or omitted) by the proponent or his duly appointed representatives (e.g. contractors) that results in overly/unnecessary disturbance or damage to the environment.
- Any action undertaken (or omitted) by the proponent or his duly appointed representatives (e.g. contractors) that could lead to (has potential for) overly/unnecessary disturbance or damage to the environment.
- Non-adherence to environmental legal requirements/laws (including the stipulations of authorisations issued in respect of a proposed activity e.g. those contained in a Record of Decision).

#### *Environmental Management Plan:*

A guideline document/directive outlining the Plan (EMP) for monitoring and institutional measures to be taken during project implementation and operation to avoid or control adverse environmental impacts, as well as the actions needed to implement these measures (World Bank, 1999:1)



*Environmental Officer:*

Person/party appointed to monitor compliance with the Environmental Management Plan.

*Interested & Affected party:*

A person, group of people, an organisation (public or private), a business, or other party that has an interest or is affected in terms of their health, property rights, or economy by a proposed activity.

*Impact:*

A description of the potential effect or consequence of an aspect of the development on a specified component of the biophysical, social or economic environment within a defined time and space.

*Mitigation Measures:*

Mitigation measures encompass all actions taken to eliminate, offset or reduce potentially adverse environmental impacts to acceptable levels (World Bank, 1999:1).



# 1 INTRODUCTION

## 1.1 Project background

Mang Geo-Enviro Services has been appointed by Makhado Local Municipality as an independent Environmental Assessment Practitioner (EAP) to undertake a full Scoping & Environmental Impact Assessment and compile an Environmental Management Programme (EMPr) for the proposed township establishment on portion 1 of the farm Naturelle Lokasie 272-LS, Makhado Local Municipality in Limpopo Province.

## 1.2 Project Description and Locality

The proposed development is located in Tshikota Extension 3 under the Jurisdiction of Makhado Local Municipality in Vhembe District Municipality, Limpopo Province. The proposed development site is approximately 33.6 hectares and the grid reference for the proposed development site is: 23°3'13.28" S 29°52' 35.03" E.



Figure 1: Locality map of the proposed development

## 1.3 The proposed demarcation incorporates the following:

- 355 Residential 1
- 3 Business 1
- 3 Educational
- 2 Public Open Space
- 1 Institutional
- Streets



## **1.4 Aim of This Document**

The purpose of this EMPr is to ensure that all environmental impacts from the various phases of development (i.e. planning, construction and operation) of the site are kept to a minimum. This includes detailing the roles and responsibilities of all parties with respect to environmental management during development, via the implementation and monitoring of this EMPr.

## **1.5 Status of The Document**

The provisions of this EMPr are binding on the Contractor (and his subcontractors, where applicable) during the Construction Period and Defects Liability Period of the contract. This specification must therefore be read in conjunction with all the documents that comprise the contract documents for this contract. In the event that any conflict occurs between the terms of the EMPr and the Project Specification, the terms of the EMPr shall stand.

On appointment of the Contractor, the Acknowledgement Form attached to the back of this EMPr (Appendix A) is to be signed by the project Applicant, Employer's Representative (ER) and all Contractors and Subcontractors, including the Contractors Designated Environmental Officer (DEO). A copy of the signed form is to be kept by the Applicant and forwarded to the independent Environmental Control Officer (ECO).

Responsibility for environmental management on the site, as stipulated in the EMPr will be handed over from the Contractor to the Applicant upon issuing of a Completion Certificate at site handover.

## **2 STATUTORY AND OTHER LEGAL REQUIREMENTS**

### **2.1 Environmental Impact Assessment (EIA) Regulations (2014)**

On review of the Environmental Impact Assessment (EIA) Regulations (2014), the proposed activity/ development triggers the following Listed Activities;

- (1) Listing Notice 1 (GN R 327):
  - Activity 28
- (2) Listing Notice 2 (GN R 325):
  - Activity 15

Based on the above, the Applicant has applied for Environmental Authorisation from the Competent Authority, Limpopo Department of Economic Development, Environment and Tourism (LEDET) for the purpose of the commencement of the above-mentioned activity.



The Applicant, however, is reminded of Section 28 of the National Environmental Management Act (Act No. 107 of 1998) (NEMA), Duty of Care and Remediation of Environmental Damage, which states the following:

*"(1) Every person who causes, has caused or may cause significant pollution or degradation of the environment must take reasonable measures to prevent such pollution or degradation from occurring, continuing or recurring, or, in so far as such harm to the environment is authorised by law or cannot be reasonably be avoided or stopped, to minimise and rectify such pollution or degradation of the environment. (2) the persons on whom subsection (1) imposes an obligation to take reasonable measures, including an owner of land, a person in control of land or premises, or a person who has a right to use the land or premises on which or in which – (a) any activity or process is or was performed or undertaken; or (b) any other situation exists, which causes or has caused or is likely to cause significant pollution or degradation of the environment. (3) The measures required in terms of subsection (1) may include measures to – (a) investigate, assess and evaluate the impact on the environment; (b) inform and educate Employees about the environmental risks of their work and the manner in which their tasks must be performed in order to avoid causing significant pollution or degradation of the environment; (c) cease, modify or control any act, activity or process causing pollution or degradation; (d) contain or prevent the movement of pollutants or the causing of degradation; (e) eliminate the source of the pollution or degradation; or (f) remedy the effects of the pollution or degradation..."*

## 2.2 Other applicable legislations

Legislations/Act	Purpose/Application of the Act/Legislation
South African Constitution (No 108 of 1996)	Chapter 2 of the Constitution comprises the Bill of Rights which makes provision for Environmental Rights. This notes that everyone has the right: <ul style="list-style-type: none"><li>• To an environment that is not harmful to their health or well-being; and</li><li>• To have the environment protected, for the benefit of present and future generations, through reasonable legislative and other measures that:<ul style="list-style-type: none"><li>✓ Prevent pollution and ecological degradation;</li><li>✓ Promote conservation; and</li><li>✓ Secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development.</li></ul></li></ul>
National Water Act, 1998 (Act No. 36 of 1998) (NWA)	The primary purpose of this Act is to manage and control South Africa's water resources by:





	<ul style="list-style-type: none"> <li>• Meeting the basic human needs of present and future generations;</li> <li>• Promoting the efficient, sustainable and beneficial use of water in the public interest;</li> <li>• Providing for growing demands for water use;</li> <li>• Protecting aquatic and associated ecosystems and their biological diversity;</li> <li>• Reducing and preventing pollution and degradation of water resources and meeting international obligations.</li> </ul>
<p>National Environmental Management: Air Quality Act, 2004 (Act No 39 of 2004) (NEMAQA)</p>	<p>This Act provides for the control of dust, noise and offensive odors.</p>
<p>Occupational Health and Safety Act, 1993 (Act No. 85 of 1993) (OHSA)</p>	<p>This Act makes provision in its Regulations for the general duties of employers to their employees. The Regulations make provisions for general duties of employers and self-employed persons to persons other than their employees.</p>
<p>National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008) (NEMWA)</p>	<p>This Act reformed the laws regulating waste management in order to protect health and the environment by providing reasonable measures for the prevention of pollution and ecological degradation and for securing ecologically sustainable development; to provide for institutional arrangements and planning matters; by providing for national norms and standards for regulating the management of waste by all spheres of government; by providing for specific waste management measures; by providing for licensing and control of waste management activities; by providing for the remediation of contaminated land; by providing for the national waste information system; and by providing for compliance and enforcement and for matters connected therewith.</p>



### 3 IMPLEMENTATION OF THE EMPR

#### 3.1 The Applicant

Makhado Local Municipality

Civic Centre

No 83 Krogh street

Louis Trichardt

0920

Cell: 082 529 9969

Email: [rhudzanip@makhado.gov.za](mailto:rhudzanip@makhado.gov.za)

- 1.1.1. The overall responsibility for ensuring compliance lies with Makhado Local Municipality.
- 1.1.2. Makhado Local Municipality shall ensure that the contract all staff members, sub-contractors (if any) and suppliers understand and adhere to the EMPR.
- 1.1.3. Makhado Local Municipality shall ensure that all sub-contractors (if any) and suppliers are contractually bound to adhere to the EMPR and Environmental Code of Conduct.

#### 3.2 Environmental Control Officer

- 1.1.4. The Applicant shall nominate a suitably qualified staff member or consultant as Environmental Control Officer (ECO) to supervise the implementation of the EMPR.
- 1.1.5. The ECO must be notified of this appointment and furnished with the contact details of the ECO.
- 1.1.6. The ECO shall be responsible for:
  - Day to day implementation of the EMPR and coordination of all environmental matters on site.
  - Ensuring that all staff members are adequately trained and aware of the EMPR and its Environmental Code of Conduct.
  - Liaison with the project manager, client and public.



## **4 GENERAL REQUIREMENTS OF EMPR**

### **4.1 EMPr Administration.**

#### **i. Operational Phase**

During the Operational Phase, a copy of this EMPr must be maintained. All senior operational and maintenance staff will be required to familiarise themselves with the contents of the document and will have to sign a register to the effect that they have read and understood the contents of the document. If necessary, the ECO can conduct a training session with senior personnel regarding the implementation of the EMPr during the Operational Phase. Senior staff will be required to educate their operational staff as to the contents of this document and how to remain compliant.

#### **ii. Decommissioning Phase**

The same principles as noted in the Construction Phase will apply.

No decommission is envisaged for this development. Further, decommissioning is likely to trigger listed activities in terms of the National Environmental Management: Waste Act, 59 of 2008 which will require detailed assessment and authorization.

### **4.2 Roles and Responsibilities**

#### **i. LEDET**

LEDET is the designated authority responsible for authorising the EMPr related to the development. LEDET has overall responsibility for ensuring that the proposed township complies with the conditions of this EMPr.

Makhado Local Municipality under the South African environmental legislation is accountable for the potential impacts of the activities that are undertaken and is responsible for managing these impacts. The License/ authorization holder therefore has overall environmental responsibility to ensure that the implementation of this EMPr complies with the relevant legislation and the conditions of this EMPr. The License / Environmental Authorisation Holder will appoint a Contractor to undertake the construction and operation of the proposed development but will still ultimately be responsible for any environmental impacts.

#### **ii. Employer's Representative (ER)**

The appointed Civil and Consulting Engineers as the Employer's Representative (ER), would act as the Employer's on-site implementing agent, together with the appointed Contractors during the Construction and Operational Phases. The ER will have the responsibility to ensure that the Employer's responsibilities are executed in compliance with the relevant legislation and this EMPr.



In addition to general project management, the ER, together with the License/ Authorisation Holder, has the responsibility to appoint the Environmental Control Officer (ECO). Any on-site decisions regarding environmental management, however, are ultimately the responsibility of the ER.

### **iii. Operations Manager**

During the Operational Phase, the Operations Manager will have the responsibility to ensure that the Licence Holder's responsibilities are executed in compliance with the relevant legislation and this EMPr. Any on-site decisions regarding environmental management are ultimately the responsibility of the Operational Manager.

The Operations Manager is to fully familiarise him / herself with the contents of this EMPr in terms of the Operational Phase. He / she will be required to sign the register confirming his / her familiarity with the document (see Appendix A). The Operations Manager must furthermore possess the necessary skills to action environmental management to all personnel under the employment of the Licence Holder and must ensure compliance with the requirements of the EMPr on a daily basis.

### **iii. Environmental Awareness Training**

The Operations Manager shall ensure that adequate Environmental Awareness Training of senior site personnel takes place and that all Construction and Operational Phase workers receive an Induction Presentation on the importance and implications of the EMPr.

The presentation shall be conducted, as far as possible, in the employees' language of choice.

As a minimum, training shall include:

- Explanation of the importance of complying with the EMPr;
- Discussion of the potential environmental impacts of construction / operational activities;
- The benefits of improved personal performance;
- Employees' roles and responsibilities, including emergency preparedness;
- Explanation of the mitigation measures that must be implemented when carrying out their activities;
- Explanation of the specifics of this EMPr and its implementation; and
- Explanation of the management structure of individuals responsible for matters pertaining to the EMPr.
- The Operations Manager shall keep records of all Environmental Training Sessions, including names, dates and the information presented. These records will be presented to the ECO on request during his / her audits.



## **5 ENFORCING THE EMPR**

The Applicant, or their designated representatives, has an overall responsibility to ensure that all those people involved / appointed to the project are aware of and familiar with its environmental requirements. The EMPr shall be part of the terms of reference for all contractors, sub-contractors and suppliers. All contractors, sub-contractors and suppliers have to give some assurance that they understand the EMPr and that they will undertake to comply with the conditions therein.

All senior and supervisory staff members shall familiarise themselves with the full contents of the EMPr. They shall know and understand the specifications of the EMPr and shall be able to assist other staff members in matters relating to the implementation of the EMPr.

All parties involved in the project must sign an acknowledgement that they are familiar with the requirements of the EMPr. These records must be kept on file by the Applicant.

## **6 PHASES OF THE PROJECT**

The following abbreviations will be applicable in all phases of the project:

ER = Employer's Representative / Implementing Agent

DEO = Designated Environmental Officer

C = Contractor

OM = Operations Manager

## 6.1 Planning/ Designing Phase

Planning/ Designing Phase	Responsibility	Monitoring	Timeframe
Obtaining an environmental authorization from LEDET prior to the demarcation of sites.	ER	Applicant	Once off
Signing of service agreement between the applicant and the relevant service providers	Applicant	Applicant	Once off
Appointment of the contractor	Applicant	Applicant	Once off

## 6.2 Construction Phase

Construction Phase	Responsibility	Monitoring	Timeframe
<b>Layout</b>			
<p>The Contractor is to adhere to the following with regards to the Materials Storage Area and Contractors Camp:</p> <ul style="list-style-type: none"> <li>✓ All servitudes and existing services must be verified prior to construction;</li> <li>✓ The camp site must be fenced before construction commences; and</li> <li>✓ Site establishment shall not take place on steep slopes, within 50m of wetland areas and watercourses (including drainage lines), or sites declared as no-go areas.</li> </ul>	C	ER & DEO	Before construction
Adequate parking must be provided for site staff and visitors. This must be demarcated so not as to encroach into the surrounding environment.	C	ER & DEO	Duration of Construction Phase
<b>Temporary Fencing</b>			



Areas where construction activities (including temporary access tracks) are prohibited are referred to as no-go areas. Entry into these areas by any person, vehicle or equipment without the ER's written permission will result in a penalty.	C	ER & DEO	Duration of Construction Phase
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The Contractor shall erect temporary fencing along the perimeter of the contractor's site camp and designated no-go areas.	C	ER & DEO	Duration of Construction Phase
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The Contractor shall maintain in good order all demarcation fencing and barriers for the duration of construction activities, or as otherwise instructed.	C	ER & DEO	Duration of Construction Phase
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<b>Topsoil removal and Stock pilling</b>			
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The Contractor shall remove topsoil from all areas where topsoil will be impacted on by construction activities, including temporary activities such as storage and stockpiling areas.	C	ER & DEO	Ongoing
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The Contractor should ensure that the foundation type is a reinforced strip foundation founded on a G6/G7 engineered soil mattress.	C	ER & DEO	Ongoing
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Stripped topsoil shall be stockpiled in areas agreed with by the ER for later use in rehabilitation and shall be adequately protected. Topsoil is considered to be the natural soil covering, including all the vegetation and organic matter. The depth of the soil may vary and due to this reason the top 300mm of soil must be removed and preserved as topsoil.	C	ER & DEO	Ongoing
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Topsoil stockpiles shall be convex in shape and no more than 2m high. Stockpiles shall be shaped so that no surface water ponding can take place.	C	ER & DEO	Ongoing
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The contractor should ensure that the removal of the vegetation is minimum during the construction in order to avoid the increasing risk of erosion	C	ER & DEO	Ongoing
Topsoil stockpiles shall be protected from erosion by wind and rain by providing suitable stormwater and cut-off drains (approved by the ER) and / or the establishment of temporary indigenous vegetation.	C	ER & DEO	Ongoing

Any topsoil contaminated by hazardous substances shall not be used but shall be disposed of at a registered landfill site. Proof of appropriate disposal must be filed in the Environmental File in the Contractor's Camp.	C	ER & DEO	Ongoing
The Contractor shall be held responsible for the replacement, at his expense, of any unnecessary loss of topsoil due to his failure to work according to the requirements of this EMPr.	C	ER & DEO	Ongoing

**Ground water protection**

The contractor should ensure that the site do not contain shallow water table and it will not have stagnant water.	C	ER & DEO	Ongoing
The Contractor should ensure that the area has a low Permeability soils.	C	ER & DEO	Ongoing
The contractor should ensure that the site does not consist of gravel, coarse sands or areas underlain by narrow cracks of bedrock.	C	ER & DEO	Ongoing
The contractor should avoid areas with high sensitive ecological areas and makes sure that the site is not close to vleis, estuaries and wetlands.	C	ER & DEO	Ongoing





The contractor should ensure hazardous waste is stored properly to avoid leaching in groundwater during rainfall	C	ER & DEO	Ongoing
The contractor should ensure that there are no spillage from vehicles which may impact the groundwater and the surface water.	C	ER & DEO	Ongoing
The contractor should make sure that the waste is not dumped in an area where water collects.	C	ER & DEO	Ongoing

**Workshop, Equipment Maintenance and storage**

All vehicles and equipment shall be kept in good working order to maximize efficiency and minimise pollution.	C	ER & DEO	Ongoing
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**Stockpiling**

The Contractor shall plan his activities so that materials can be transported directly to and placed at the point where it is to be used.	C	ER & DEO	Ongoing
Should temporary stockpiling become necessary, the areas for the stockpiling of excavated / imported material shall be indicated and demarcated on the site plan submitted in writing to the ER for his approval, together with the Contractor's proposed measures for prevention, containment and rehabilitation against environmental damage?	C	ER & DEO	Ongoing
Stockpiles shall be positioned and sloped to create the least visual impact.	C	ER	Ongoing



The contractor should ensure to excavate the in-situ material down to 0.9m in order to spoil and stockpile. Excavated sand may be mixed with course material and be utilized for construction and foundation lining	C	ER	Ongoing
Stockpiles shall be positioned and sloped to create the least visual impact.	C	ER	Ongoing
<b>Stormwater Control</b>			
Temporary stormwater control measures must be installed as and when necessary, to prevent and minimise the erosion of exposed soils.	C	ER & DEO	Ongoing
The drainage system should be designed in such a way that water is channelled from roads into a suitable storm water drainage system to avoid structural distress over a period of time.	C	ER & DEO	Ongoing
If deemed necessary to prevent erosion and environmental degradation, cut-off drains must be installed to facilitate the control of surface water runoff velocities.	C	ER & DEO	Ongoing
Stormwater will drain according to the slope of the natural ground.			
Stormwater control barriers must be used to divert surface water runoff into vegetative buffers and not directly into the exposed workings or onto adjacent roads.	C	ER & DEO	Ongoing
<b>Hazardous Substances</b>			
Should any hazardous material/substances (e.g. petrochemicals, paints, etc.) need to be stored on the site, this shall be under controlled conditions. All hazardous materials/substances shall be stored in a secured, appointed area that is fenced and has restricted entry All storage shall take place using suitable, sealable containers to the approval of the ER. These containers must be placed within a bunded area which has the capacity to contain 110% of the total volume it	C	ER & DEO	Ongoing



stores. The floor and wall of the bund area shall be impervious to prevent infiltration of any spilled / leaked material into the soil.			
Material Safety Data Sheets (MSDS's) must be readily available for all chemicals / hazardous substances to be used on site. Where possible and available, MSDS's should include additional information on ecological impacts and measures to minimise and mitigate against any negative environmental impacts in the result of an accidental spill.	C/ER	ER & DEO	Before commencement of construction
Ensure that any hydrocarbon/chemical/hazardous substance spills are cleaned up as soon as possible.	C	ER & DEO	Ongoing
<b>Noise Control</b>			
It must be ensured that noise levels are kept to a minimum during the Construction Phase. All machinery and equipment to be utilised on the site should be fitted with mufflers and must be maintained in good working order to minimise noise levels. It is recommended further that the Contractor encourage construction workers to minimise shouting and hooting on the site.  Construction work should be completed in as short a time frame as possible in order to limit the longevity of these impacts.	C	ER & DEO	Ongoing
The Contractor shall restrict all operations that result in undue noise disturbance to local communities and / or dwellings to daylight hours on workdays (Monday to Friday) or as otherwise agreed with the ER.	C	ER & DEO	Ongoing
The Contractor shall warn any local communities and / or residents that could be disturbed by noise generating activities well in advance and shall keep such activities to a minimum.	C	ER & DEO	Ongoing
The Contractor shall be responsible for compliance with the relevant legislation with the respect to noise.	C	ER & DEO	Ongoing



The entire Contractors' equipment shall be fitted with effective exhaust silencers and shall comply with the SANS recommended code of practice Code 0103:1983, for construction plant noise generation.	C	ER & DEO	Ongoing
<b>Waste Management</b>			
General construction waste: Must be removed from bins at enough intervals to prevent overflow. This waste must be stored in skips within a designated waste storage area in the Contractor's Camp. General waste must be transported to the local municipal General Waste Landfill Site by the Municipality, the Contractor or a private waste disposal Contractor. Service agreements in this regard must be obtained by the Applicant / Contractor prior to the commencement of construction activities. It is recommended that general wastes be separated on site and delivered to appropriate depots for recycling. This would be facilitated by the provision of separate and labelled bins / skips.	C	ER	Ongoing
The Contractor shall ensure that all site personnel are instructed in the proper disposal of all waste.	C	ER	Ongoing
Demarcated and fenced areas where waste can be safely contained and stored on a temporary basis within the Contractors Camp must be established. General waste storage areas must be separate from hazardous waste storage areas. When adequate volumes (not more than 1 month) have accumulated, waste is to be removed from site and disposed of at a licensed facility.	C	ER	Ongoing
Waste is not to be buried or burned on site.	C	ER	Ongoing
<b>Dust Control</b>			
Construction vehicles shall comply with speed limits and haul distances shall be minimised. Material loads shall be suitably covered and secured during transportation.	C	ER & DEO	Ongoing



Exposed soils and material stockpiles shall be protected against wind erosion. The location of stockpiles shall take into consideration the prevailing wind directions and locations of sensitive receptors.	C	ER & DEO	Ongoing
The Contractor shall implement dust suppression measures (e.g. Water spray vehicles, covering material stockpiles, etc.) if and when required.	C	ER & DEO	Ongoing
Environmentally friendly soil stabilisers may be used as additional measures to control dust on gravel roads and construction areas if complaints are received regarding dust generation. This is especially pertinent as excessive dust could disturb moving vehicles on adjacent roads, creating a potential traffic hazard.	C	ER & DEO	Ongoing
The Contractor shall ensure that the generation of dust is minimised and shall implement a dust control programme, as necessary, to maintain a safe working environment and minimise nuisance for surrounding residential areas/dwellings.	C	ER & DEO	Ongoing
<b>Protection of Fauna and Flora</b>			
The Contractor shall ensure his employees do not undertake any hunting, trapping, shooting, poisoning or other disturbance of any fauna on-site or in the areas surrounding the site.	C	ER & DEO	Ongoing
The Contractor should limit all developments to the minimum area required, and leave as much as possible natural vegetation intact.	C	ER & DEO	Ongoing
The contractor should conserve the areas that will not be developed, Particularly the relative large plant species( <i>Schlerocharia birrea</i> ) that is present in the proposed development area	C	ER & DEO	Ongoing
The contractor should ensure if one big plant is removed it must be replaced by four juveniles of the same species.	C	ER & DEO	Ongoing
The feeding of any wild animals is prohibited.	C	ER & DEO	Ongoing



The use of pesticides is prohibited unless approved by the ER.	C	ER & DEO	Ongoing
<b>Fire Control</b>			
The Contractor shall ensure that basic fire-fighting equipment is available at all construction activities on site.	C	ER & DEO	Ongoing
The Contractor shall appoint a Fire Officer who shall be responsible for ensuring immediate and appropriate action in the event of a fire.	C	ER & DEO	Ongoing
The Contractor shall ensure that all site personnel are aware of the procedure to be followed in the event of a fire.	C	ER & DEO	Ongoing
<b>Protection of Heritage and cultural features</b>			
If any archaeological or paleontological artefacts or remains / graves are uncovered during earthmoving activities, work in the vicinity of the find shall cease immediately. The Contractor shall immediately notify the ER, who shall contact the relevant Competent Authority (SAHRA) who will take appropriate steps.	C	ER & DEO	Ongoing
The Contractor will be required to abide by the specifications as set out by the Competent Authority or the Heritage Specialist appointed to investigate the find.	C	ER & DEO	Ongoing
Should any archaeological or cultural features be discovered the contractor should ensure to inform the heritage authorities.	C	ER & DEO	Ongoing
The Contractor may not, without a permit issued by the relevant heritage resources authority, destroy damage, excavate, alter, deface or otherwise disturb archaeological material.	C	ER & DEO	Ongoing
<b>Environmental Education &amp; Awareness</b>			



It is the Contractors' responsibility to provide the site foreman with no less than 1 hour's environmental training and to ensure that the foreman has enough understanding to pass this information onto the construction staff.	C	ER & DEO	Prior to moving on site
The Contractor / ECO must be on hand to explain any technical issues and to answer questions.	C/ECO	ER & DEO	Ongoing

### 6.3 OPERATIONAL PHASE

Operational Phase	Responsibility	Occurrence	Method
<b>Water Quality Management</b>			
The Makhado Local Municipality must be contacted with regard to any discharge to sewer.	OM	Ongoing	Site inspection

<b>Management of Contaminated Land</b>			
Contaminated land investigations, including soils, groundwater and surface water monitoring and sampling to be implemented should impact is observed. This will take into account the source-pathway-receptor (S-P-R) linkages and should serve to determine the nature and extent of any impacts to the receiving environment as a result of site activities. These investigations	OM to outsource as appropriate	Ongoing	Site investigation



are to be carried out with consideration of the relevant legal processes. Risk assessment to be undertaken if considered necessary.			
Risk based corrective action (RBCA) to be implemented based on the findings of the site investigations. Remedial plans will be developed based on conceptual site model (CSM) and should consider S-P-R linkages. Remedial actions may include physical, chemical and/or microbiological intervention.	OM to outsource as appropriate	Ongoing	Site remediation
Post-remediation monitoring plan to be implemented to determine effectiveness of remedial actions and serve as an early-warning system for potential re-occurrence.	OM to outsource as appropriate	Ongoing	Ongoing monitoring
<b>Drainage Systems</b>			
Stormwater culverts and drains must be covered with metal grids to prevent blockages.	OM	Ongoing	Site inspection
<b>Control of Littering</b>			
Adequate waste disposal bins are to be provided around the township. These are to be regularly emptied and the contents thereof collected by an approved Waste Service Provider.	OM	Ongoing	Site inspection
The recycling of waste is encouraged. As such, the provision of separate recycling bins for the disposal of paper, tins and plastic should be erected and displayed in a suitable and visual	OM	Ongoing	Site inspection





location on site. A reputable Recycling Waste Company must be appointed to collect recyclable waste (if applicable).			
<b>Waste Storage and Removal</b>			
Burning of waste is not permitted, under any conditions.	OM	Ongoing	Site inspection
<b>Health and Safety</b>			
Ensure that all staff is trained in what to do in the case of an emergency such as an on-site fire.	OM	Ongoing	Site inspection
Staff personnel are to be trained in first aid.	OM	Ongoing	Site inspection
<b>Fire Control</b>			
Emergency numbers must be displayed with the correct details of the nearest firefighting station at all times.	OM	Ongoing	Site inspection
Ensure that relevant signage e.g. no smoking, is displayed in potentially dangerous areas and is abided by.	OM	Ongoing	Site inspection

## **6.4 DECOMMISSIONING PHASE**

At this stage decommissioning is not foreseen in the near future. At the time it might become applicable, an Environmental Impact Assessment must be undertaken in terms of Listed Activity Nr 31 (i) of R326 of the National Environmental Management Act, 1998 (Act No 107 of 1998), as amended; or else compliance with the environmental legislation requirements applicable at that time must take place.

## **7 NONE-COMPLIANCE**

### **7.1 Procedures**

The Contractor shall comply with the environmental specifications and requirements on an on-going basis and any failure on his / her part to do so will entitle the ER to impose a penalty.

In the event of non-compliance, the following recommended process can be followed:

- The ER shall issue a Notice of Non-compliance to the Contractor, stating the nature and magnitude of the contravention. A copy shall be provided to the ECO during his / her site audit;
- The Contractor shall act to correct the non-conformance within 24 hours of receipt of the notice, or within a period that may be specified within the notice;
- The Contractor shall provide the ER with a written statement describing the actions to be taken to discontinue the non-conformance, the actions taken to mitigate its effects and the expected results of the actions. A copy shall be provided to the ECO;
- In the case of the Contractor failing to remedy the situation within the predetermined timeframe, the ER shall impose a monetary penalty based on the conditions of contract;
- In the case of non-compliance giving rise to physical environmental damage or destruction, the ER shall be entitled to undertake or to cause to be undertaken such remedial works as may be required to make good such damage and to recover from the Contractor the full costs incurred in doing so; and
- In the event of a dispute or difference of opinion between any parties arising out of the interpretation of the conditions of the EMPr, or a disagreement regarding the implementation or method of implementation of conditions of the EMPr, any party shall be entitled to require that the issue be referred to specialists for arbitration.

The ER shall at all times have the right to stop work and/or certain activities on site in the case of noncompliance or failure to implement remediation measures.



## 7.2 Offences and Penalties

Any avoidable non-compliance with the conditions of the EMPr shall be considered sufficient ground for the imposition of a penalty. Possible offences, which must result in the issuing of a contractual penalty, include, but are not limited to:

- Unauthorised entrance into no-go areas;
- Unauthorised damage to natural vegetation;
- Unauthorised camp establishment (including stockpiling, storage etc.);
- Hydrocarbons/hazardous material: Negligent spills/leaks and insufficient storage;
- Ablution facilities: Non-use, insufficient facilities and insufficient maintenance;
- Late Method Statements or failure to submit Method Statements;
- Insufficient solid waste management (including clean-up of litter, unauthorised dumping and absence of weigh bills as proof of disposal at a DWS registered landfill site);
- Erosion due to negligence/non-performance;
- Excessive cement / concrete spillage / contamination;
- Insufficient fire control and unauthorised fires;
- Preventable damage to water courses or pollution of water bodies; and
- Non-induction of staff.

## 8 CONCLUSION

In terms of NEMA, everyone is required to take reasonable measures to ensure that they do not pollute the environment. Reasonable measures include informing and educating employees about the environmental risks of their work and training them to operate in an environmentally responsible manner. Furthermore, in terms of NEMA, the cost to repair any environmental damage shall be borne by the person responsible for the damage.

If the above-mentioned management recommendations are adopted, it is anticipated that most of the negative environmental impacts associated with the operation of the township in Tshikota extension 3 within the Makhado Local Municipality, in Limpopo Province can be mitigated. The appointed ECO will need to regularly monitor the site to ensure that the required environmental controls are in place and working effectively.



**ANNEXURE A**  
**ENVIRONMENTAL CODE OF CONDUCT**

The applicant is committed to ensuring that the operation of the development is done according to the highest environmental standards so that the ecological footprint of the development is minimised where possible.

The applicant requires that all personnel involved in the operation process accept their responsibilities towards the EMP and the environment. This includes all permanent, contract or temporary workers as well as any other person involved with the project or visiting the site. Ignorance, negligence, recklessness or a general lack of commitment will not be tolerated.

If you do not understand the rules you must seek assistance to ensure compliance. The following people can assist you in ensuring compliance with the EMP.

**Your Supervisor:** .....

**Environmental Control Officer:** .....

**Project Manager:** .....





ANNEXURE C

<b>Environmental Incidents Register</b>					
<b>Date</b>	<b>Incident</b>	<b>Action Required</b>	<b>Responsible Person</b>	<b>Action Implemented</b>	<b>Date Action Implemented</b>



**ANNEXURE E**  
**ENVIRONMENTAL AUTHORISATION / ROD**



**ANNEXURE F**  
**EAP CV**

**ENVIRONMENTAL MANAGEMENT PLAN FOR THE PROPOSED TOWNSHIP ESTABLISHMENT ON  
PORTION 1 OF THE FARM NATURELLE LOKASIE 272-LS, MAKHADO LOCAL MUNICIPALITY IN  
LIMPOPO PROVINCE**

**ENVIRONMENTAL MANAGEMENT PROGRAMME**

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EAP Signature \_\_\_\_\_

Date \_\_\_\_\_



## Appendix G – Declarations