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***DEVELOPMENT OF MKHUHLU TRAFFIC TRAINING
ACADEMY***

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GEOTECHNICAL REPORT

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MKHUHLU TRAFFIC TRAINING ACADEMY

TABLE OF CONTENTS

	<u>Page</u>
1. INTRODUCTION	1
2. METHODS OF INVESTIGATION	2
3. SITE SOILS AND GEOLOGY	2
4. SEEPAGE AND RUN OFF	3
5. FOUNDATION ASSESSMENT	3
6. RECOMMENDATIONS	5
7. GENERAL	5

LIST OF APPENDICES

- Appendix A – Site Plan and Pictures**
- Appendix B – Test Pit Result**
- Appendix C – DCP Test Result**

1. INTRODUCTION

1.1 Terms of Reference

This report presents the results of a geotechnical investigation into the foundation conditions and suitable excavation procedures for the proposed land development at Mkhuhlu site (GPS: S24 57'01.4"; E031 16' 33.9"). The investigation was authorised by Mr D. Korir on behalf of the development team of KMSD engineering consultants.

The site is located at Mkhuhlu at hlanzeni district Municipality and the locality map is attached in this report as reference.

The objectives of the geotechnical investigation were to:

- Establish the soil profiles across the site and evaluate their engineering properties and suitability for the proposed development.
- Assess the groundwater conditions, including surface run off, seepage, ponding, and note the occurrence of any perched or permanent water tables.
- Evaluate the workability of the site materials with regard to their excavatability and compactability and locate possible material sources outside the premises to replace unsuitable foundations materials.
- Comment on predicted safe bearing capacity values and expected heave.
- Classify the site for development suitability according to the geotechnical categories proposed by the SAIEG in their guidelines for engineering geotechnical investigations.

The report is based on the information obtained from the excavation of test pits, profiling and sampling of representative soil, the insitu testing and the laboratory testing of disturbed soil samples, as well as DCP tests.

1.2 Site details and assumptions

It is understood that the structures will comprise of single storey campus facility with an access road to the area with foundation pressures ranging up to 100KPa.

The propose site is located opposite a developed area in Mkhuhlu refer to the site plan attached. The site is vacant and can be used according to the architects design.

The terrain drains towards the east part of the site and surface water follows to the natural slope of the site.

1.3 Available Information

Geological, hydro geological, topographical, locality and aerial information was obtained from the following sources:

- Site plan (Surveyed and GoogleEarth)
- Geological Map

2 METHODS OF INVESTIGATION

The initial investigation comprised a walk over survey to identify the site boundaries and positions of the test pit and DCP test.

The subsurface investigation comprised of the excavation of test pits using man power/manual labour.

2.1 Test Pitting, Profiling, Sampling and Soil Testing

Six test pits were excavated using a man power. The test pits were excavated to the excavation limit depths which vary between 1.0m and 1.2m below surface. The test pits were profiled according to the soil type and colour.

Six soil samples were representative of the various soil layers were collected and subjected to laboratory testing. Since the types of soil were generally the same, six foundation indicator tests were carried out.

The soil tests carried out on the samples are discussed in more detail as follows:

Foundation indicator tests comprising of a particle size distribution analysis (sieve and hydrometer grading) and Atterberg Limits tests.

These tests permit a basic classification of the soils and group them according to typical engineering properties.

Six compaction tests comprising of Modified AASHTO moisture/density relationship and CBR values.

These test evaluates the compaction characteristics of the site soils and permits an evaluation of their suitability for use as construction materials.

2.2 DCP Test

Fourteen DCP test were carried from surface down to about 1m below surface. The DCP tests were carried out to assess the bearing capacity of the insitu material. According to the dcp the insitu material under 800 is suitable for construction.

3 SITE SOILS AND GEOLOGY

The geological information taken from the geological map shows that the area is on. Archaeozoic, Swazian, Archaean super group.

Based on the fieldwork, the area of investigation has been sub-divided into one geotechnical zone since the test pit show that the underlying materials are similar. The soil profile within the zone is summarized below.

The zone is based on the classification system given by the NHBRC and SAICE Code of Practice (1995). The Zone is described in the following sub-section.

Zone1: Thin topsoil with root overlying with sand type of material. The average topsoil cover is 200mm, as you proceed from 200mm-600mm the material is sandy you find good material from 600mm and 800mm. The zone covers the majority of the site.

The topsoil layer is +/- 200mm comprises of sandy material with vegetation root. The remaining layer from 600mm comprises of light reddish mixture type from depth below 600mm. Generally the material below 600mm meet the specification of G7 material. Based on NHBRC, the area of the site can be classified as **SITE CLASS H1**.

4 SEEPAGE AND RUN OFF

No perched water table or zones of seepage were observed in any of the test pits throughout the area of investigation.

The surface run off from the site will be channelled towards the east of the site to follow the natural slope of the terrain.

5 FOUNDATION ASSESSMENT

The soil and weathered rock strata have been examined and tested to determine their suitability as founding horizons for the proposed development according to the following criteria:

- Strength and bearing capacities of the founding materials determined from estimated field consistencies and DCP test.
- Compressibility of the founding materials expressed in terms of their consistencies and deformation modulus.
- Potential heave in the residual soils.

5.1 Estimated Allowable Bearing Capacity

The site is underlain by sandy silt material. Based on the DCP test, the insitu CBR below 600mm is approximately 30. Used the correlation table, we can establish the allowable bearing capacity below 0.6m can be considered safely as 250KPa.

5.2 Estimated Compressibility and Settlement

The results of the visual assessment of the soil consistency and the DCP test have been interpreted into the compressibility description.

Below 0.2m, the material can be described as:

Zone 2: Sandy, easily penetrated with OVER 20mm bar driven with 2Kg hammer; With not much resistance to shovelling and not very good for foundation with an estimated total settlement more than 10mm.

5.3 Foundation Options

The selection of founding options is a function of cost and tolerance to total settlement (such as plant and equipment) and differential settlement (such as building and structures).

Note that foundations should not span residual soils and un-compacted fill, since fill that is not adequately compacted, can translate into significant differential settlement even with light loads and minimal total settlement (<10mm). Where this is unavoidable the engineer should design structurally in such a way as to accommodate total settlement as differential settlement.

Base on the Site Classification, the following is recommended for the foundation:

- Normal Construction strip foundation, the width of the strip to be determined by the Engineer based on the load of the structure and the recommended bearing capacity of the soil.
- The foundation should be place at least 800mm below the existing ground.
- The foundation to be designed on the allowable bearing capacity of 250KPa.
- Site drainage and service/plumbing precautions recommended.

5.4 Workability of Site Materials

Excavation procedures for the installation of services and the excavation of cut terraces have been evaluated according to the South African National Standards standardised excavation classification for earthworks (SABS 1200D, DA, DB). According to this classification the area of investigation classifies as **Soft excavation** to depths varying between 0.2-1m (average depth 1.2m) within Zone 1.

Thus no excavation problems are envisaged for this geotechnical zone.

Table 2: Excavatability Summary

Material Type	Excavatability	Aver. Depth (m)	Proposed excavation Method
Residuum and very soft material	Soft	0-500	TLB or Hand Excavation
Soft rock	Intermediate	500-1000	Excavator
Hard rock	Hard	N/A	Blasting

The material present on site from 0.0 to 0.2m can be generally classify as top soil to cut off and for 0.2 down as sandy silt mixture.

6 RECOMMENDATIONS

6.1 Foundation Construction

Founding conditions are assessed to be reasonable to favourable due to the following factors:

- Generally gentle slope ground which will result in marked differential founding conditions from the cut (shallow) to fill (deep) portion of building platforms;

Zone 1

Foundation construction is to allow for single storey units in accordance with the architectural proposals.

Accordingly, one founding option to engineer's detail to cater for the proposed development.

Normal Strip Foundation:

- Normal strip footings.
- The foundation should be constructed below 0.8m from the existing ground level.
- Site drainage and plumbing/service precautions.

The site has a fairly constant cover of top soil up to an average depth of 0.2m sequentially underlain by sandy silt below the topsoil.

7 GENERAL

Every effort was made during the site investigation to ensure that generally accepted practices of our professions were used in the sub surface evaluation of the site, and that the sampling and testing was representative of the soil conditions observed on site. However it is impossible under the constraint of a restricted investigation of this nature to guarantee that zones of either poorer foundation conditions, or harder rock excavation were not identified. The investigation has attempted, through interpolation and extrapolation of known test locations, to predict potential problem issues of geotechnical nature and thus provide guidance to design engineers. Variances in soil and rock quality and quantity from those predicted may be encountered during construction and these should be recorded, however no warranty

against these variations is expressed or implied, due to the geological changes that can occur over time due to natural processes or human activity.

In view of the variability inherent in natural materials, a competent person must inspect all foundation excavations at the time of construction to ensure that the materials are adequate for the proposed structure and that they are in accordance with the recommendations stated in the report. The placement of engineered fill must be controlled with suitable field test to ensure that the required densities are achieved during compaction, and that the quality of the fill material is within specification.

Although not anticipated at this site, it should be noted that this investigation did not include the assessment of any potential environmental hazards, or groundwater impacts that may be present, or ensue from the construction of the proposed structures.

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Appendix B – Test Pit Result

Appendix C – DCP Test Result

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