PHASE 1 NEAR SURFACE GEOTECHNICAL INVESTIGATION FOR THE PROPOSED TOWNSHIP ESTABLISHMENT TO BE SITUATED ON THE REMAINDER OF THE FARM DWARSLOOP 248 KU, MPUMALANGA PROVINCE OF SOUTH AFRICA

Nkanivo Development Consultants	ZWANDAZWASHU CONSULTING
Report Prepared for:	**Report Prepared by:**
Nkanivo Development Consultants Unit 79, Block 5, Lombardy Business Park 66 Graham Road Pretoria, 0084 P.O Box 11948 Silver Lakes 0054 Tell: +27 (0) 12 807 7445 Cell: +27 (0) 83 277 7347 info@nkanivo.co.za www.nkanivo.co.za Contact Person: Samuel Chauke (Managing Director)	**Zwandazwashu Consulting (Pty) Ltd** Unit 01A Stanford Park 817 16th Road Randjespark Midrand 1685 Cell: 079 0812369 / 067 706 9904 Email: admin@zwandazwashu.co.za Website: www.zwandazwashu.co.za Prepared & Compiled by: Neduvhuledza Nduvho (Cand.Sci.Nat) Reviewed by: Mavhetha Lavhelesani (GSSA Member) (Pr.Sci.Nat)

TABLE OF CONTENTS

LIST OF FIGURES iii

LIST OF TABLES iv

ACRONYMS AND ABBREVIATIONS v

EXECUTIVE SUMMARY vi

1. INTRODUCTION 1

2. SCOPE OF THE REPORT 1

3. INFORMATION USED IN THIS STUDY 2

4. SITE DESCRIPTION 2

    4.1. Site Location 2

    4.2. Climate 4

    4.3. Land use 5

    4.4. Topography 5

5. GEOLOGY 5

6. SOIL PROFILE 6

7. METHOD OF INVESTIGATION 8

    7.1. Desktop Study 8

    7.2. Field Mapping 8

    7.3. Inspection of Test Pits 8

8. LABORATORY RESULTS 10

9. HYDROGEOLOGY 14

    9.1. Drainage patterns 14

    9.2. Ground water 14

10. GEOHAZARDS 15

    10.1. Seismic activities 15

    10.2. Ground subsidence 17

    10.3. Sinkhole formation 17

    10.4. Landslides and mudslides 18

11. GEOTECHNICAL EVALUATION 18

11.1. Expansive soils 20
11.2. Collapsible soils 20
11.3. Compressible soils 20
11.4. Soil site classification 21
11.5. Excavation Classification 21
11.6. Stability of excavations sidewalls 21
11.7. Construction material suitability 22
11.8. Construction Monitoring 22
12. PRELIMINARY RECOMMENDATIONS 22
12.1. Foundations 22
12.1.1. Foundations on residual soils 22
12.2.2. Foundations on weathered Granitic tonalite 23
13. CONCLUSIONS 23
14. REPORT PROVISIONS 24
15. REFFERENCE 25
16. REPORT SIGNATURE 26
17. APPENDIX A: THE SITE PHOTOS 27

LIST OF FIGURES

Figure 1: Locality map of the site 3
Figure 2: Layout Plan of the proposed development 4
Figure 3: Geological setting of the site 6
Figure 4: Test pits position 10
Figure 5: Seismic hazard map of South Africa 16
Figure 6: Siesmic Hazard Zones of South Africa (SANS 10160-4, 2011) 17

LIST OF TABLES

Table 1: Summary of the test pit profiles 7
Table 2: Summary of the foundation indicator test results 12
Table 3: Summary of the CBR test results 13
Table 4: Residential site class designations 18
Table 5: Geotechnical Classification for Urban Development (GFSH-2 Document)............. 19

ACRONYMS AND ABBREVIATIONS

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

EXECUTIVE SUMMARY

Zwandazwashu Consulting Pty (Ltd) was appointed by Nkanivo Development Consultants to conduct phase 1 near surface geotechnical investigation for the proposed township establishment to be situated on the remainder of the farm Dwarsloop 248 KU. The general Geographical Positioning System (GPS) coordinates for proposed development are 31°5'19,353"E 24°46'32,455"S at an average elevation of 500 meters above sea level.

Test pits were positioned using a hand held GPS and the position of the test pits is shown on figure 3. The method of investigation was based on a near surface investigation, to a maximum depth of 2.3 m below existing ground level using fly wheel TLB (Tractor-Loader-Backhoe) in order to obtain information on the subsurface soil; each pit was marked, photographed and profiled by a field engineering geologist in accordance with the current standard procedures proposed by Brink and Bruin (2002). The test pit photographs are presented in Appendix A of this report.

Eleven bulk samples were collected from the Slightly moist, light brown, intact, dense, Gravelly sand. The parent Granitic tonilite rock grade varies with depth from slightly weathered medium hard rock to consolidated high strength bedrock. Homogeneity of material underlying the site was observed hence a choice of eleven bulk representative samples. The samples were found to be non-plastic. The PI along with the clay content indicated that the samples exhibit low potential expansiveness. The sample indicated CBR of 29 at 95% MOD AASHTO with a grading modulus of 1.7 for TP2, a CBR of 64 at 95% MOD AASHTO with a grading modulus of 1.5 for TP15. Based on the grading modulus, Atterberg limits and CBR the sample were classified as G6 material for TP2 and G6 for TP15 respectively.

A review of the test pit data indicates that the site is generally underlained by granitic tonalite bedrocks. The laboratory tests indicated that material underlying the site exhibits low 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. From the above discussion the site is classified into main soil area namely compressible and potential collapsible soils: According to AASHTO and COLTO the soil samples were classified as A-2-6(0) and G6 respectively. **The foundation design options as per SANS10400 H- NHBRC soil symbol is “R/C/H”. The recommended Foundation types in accordance with** SANS 10400H- Modified normal / Reinforced Deep Strip Foundation

The area investigated is underlain by top soils of sand, including residual soils derived from the in-situ weathering of granitic tonalite bedrock. Residual Granite tonalite is well developed and were encountered in the entire site from the depth of 1m below existing ground level. The excavation on site is likely to classify as “soft” to an average depth of 1m below existing ground level. Below this, “intermediate to hard” excavation is expected. Foundation recommendations include ***reinforced deep strip foundations*** on the residual soils on an engineering soil mattress and a ***normal strip foundation*** onto the medium hard rock granitic tonalite.

It is recommended that all foundations be inspected by a competent person prior to placing any concrete and regular checks on the quality and compaction of the backfill to the terraces should be made.

1. INTRODUCTION

Zwandazwashu Consulting Pty (Ltd) was appointed by Nkanivo Development Consultants to conduct phase 1 near surface geotechnical investigation for the proposed township establishment to be situated on the remainder of the farm dwarsloop 248 KU on behalf of Bushbuckridge Local Municipality of the Ehlanzeni District Municipality in Mpumalanga Province.

2. SCOPE OF THE REPORT

This report evaluates the geotechnical characteristics associated with the underlying geology and any geotechnical constraints that might affect structural integrity of the subject property. However, it is also essential to Identify engineering properties' potential influence on the design, construction and operation of the intended infrastructures. It must be noted that there were no infrastructures erected on site during the course of the investigation, thus, the site is a Greenfield.

The main objective of the investigation was aimed at defining the founding materials and establishing broader geotechnical conditions and their suitability to the establishment of township.

The following are some of the objectives of the conducted geotechnical investigation:

- To determine the geology of the site
- To establish in broad terms, the nature and relevant engineering properties of the upper soil and rock strata underlying the site.
- To ascertain the soil chemistry 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.
- Potential geotechnical limiting factors by determining the behavior and suitability of soil/rocks and their effects on the intended development;
- Assess excavation conditions
- Determine the presence or occurrence of groundwater from the surface to a maximum depth of 3 meters.
- Classification of the site material according to the TRH14 classification system

The geotechnical investigation was carried out in accordance with SAIEG and GFSH-2 guidelines and all NHBRC Home Building Manuals. This report presents findings on the geotechnical properties and characteristics of the surficial soils underlying the site, the investigation methodology and discusses recommendations for earthworks, drainage, ease of excavation and foundations.

3. INFORMATION USED IN THIS STUDY

The geotechnical investigation commenced with a desktop study using the existing geotechnical databases and maps pertaining, structural engineer specifications of the site were reviewed. It must be noted that most the literature in relation to the site are broad, this was expected because the site lack of socioeconomic transformation because it is situated outskirts of a more economical alive township Dwarsloop.

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

- Geological Map of the GSO: Scale 1: 100 000 Sheet – Geological series 2431CC
- Expansive Roadbed Treatment for Southern Africa: D J Weston (1980) 4th Int. Conf. on Expansive Soils, Vol. 1, Denver pp 339-360;
- National Home Builders Registration Council: Home Builders Manual 2015;
- Technical Recommendations for Highways – TRH14 Guidelines for Road Construction Materials by the National Institute for Transport and road research of the Council for Scientific and Industrial Research, (1985);
- SAICE’s Guidelines for Urban Engineering Geological Investigations;
- Schwartz, K. (1985). Collapsible soils. The Civil Engineer in South Africa, July, p379-393 and;
- New, M., Lister, D., Hulme, M. and Makin, I., 2002: A high-resolution data set of surface climate over global land areas. Climate Research 21:1-25
- Site plans provided by the client
- South African Weather Service

4. SITE DESCRIPTION

4.1. Site Location

The general Geographical Positioning System (GPS) coordinates for proposed development are 31°5'19,353"E 24°46'32,455"S at an average elevation of 500 meters above sea level.

The area of interest for investigation is adjacent to township of dwarsloop and Orinoco, there is presence of tar road with existing road signs and the general topography of the area is gentle in slope from South to North. The proposed site has an approximately 54.24 hectares in extent, which is expected to yield approximately 533 stands and it is located between Dwarsloop C, Baromeng and Orinoco A.

The proposed site locality map is shown in Figure 1 below.

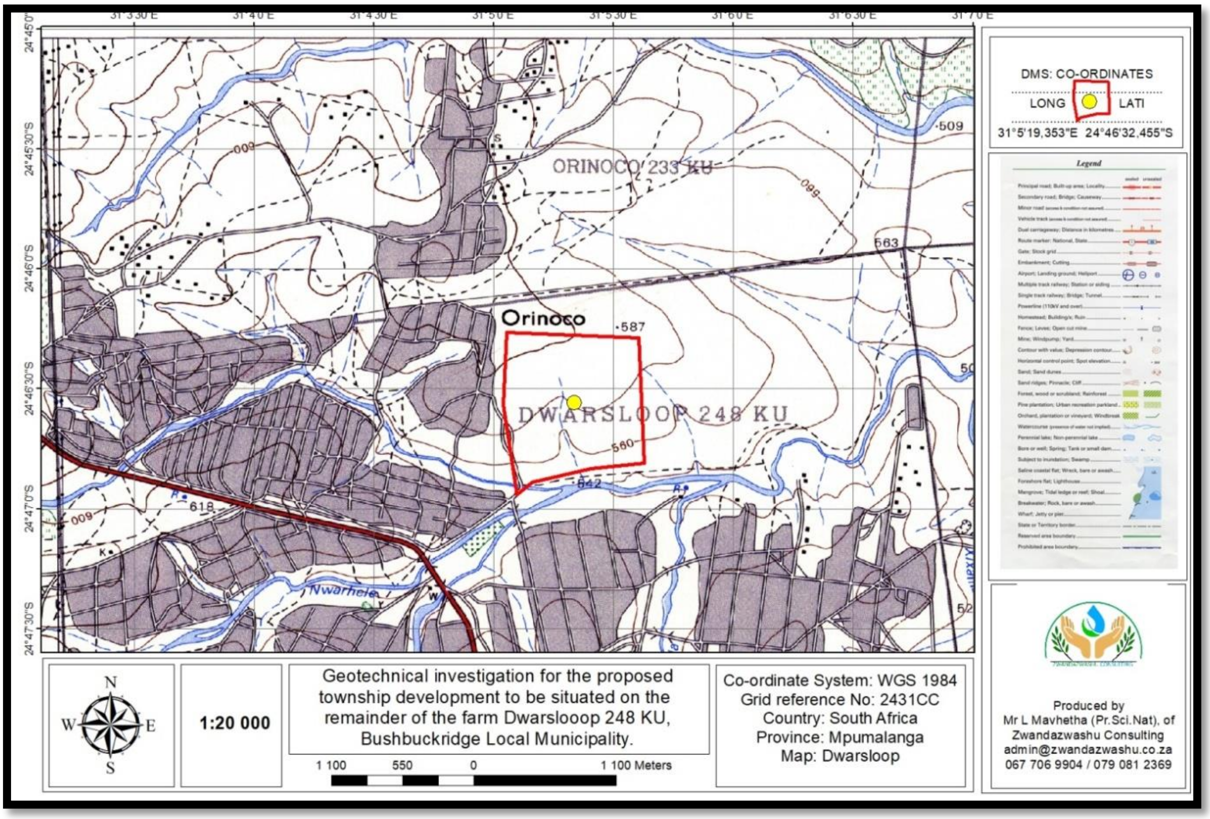


Figure 1: Locality map of the site

The proposed project land-use is follows as indicated in Figure 2:

- 32.07 Ha of residential area
- 3.78 Ha of public open space
- 3.24 Ha of Primary school
- 0.65 Ha of business area
- 0.30 Ha designated for Church
- 0.27 Ha designated for Crèche
- 13.93 will be covered with roads/streets

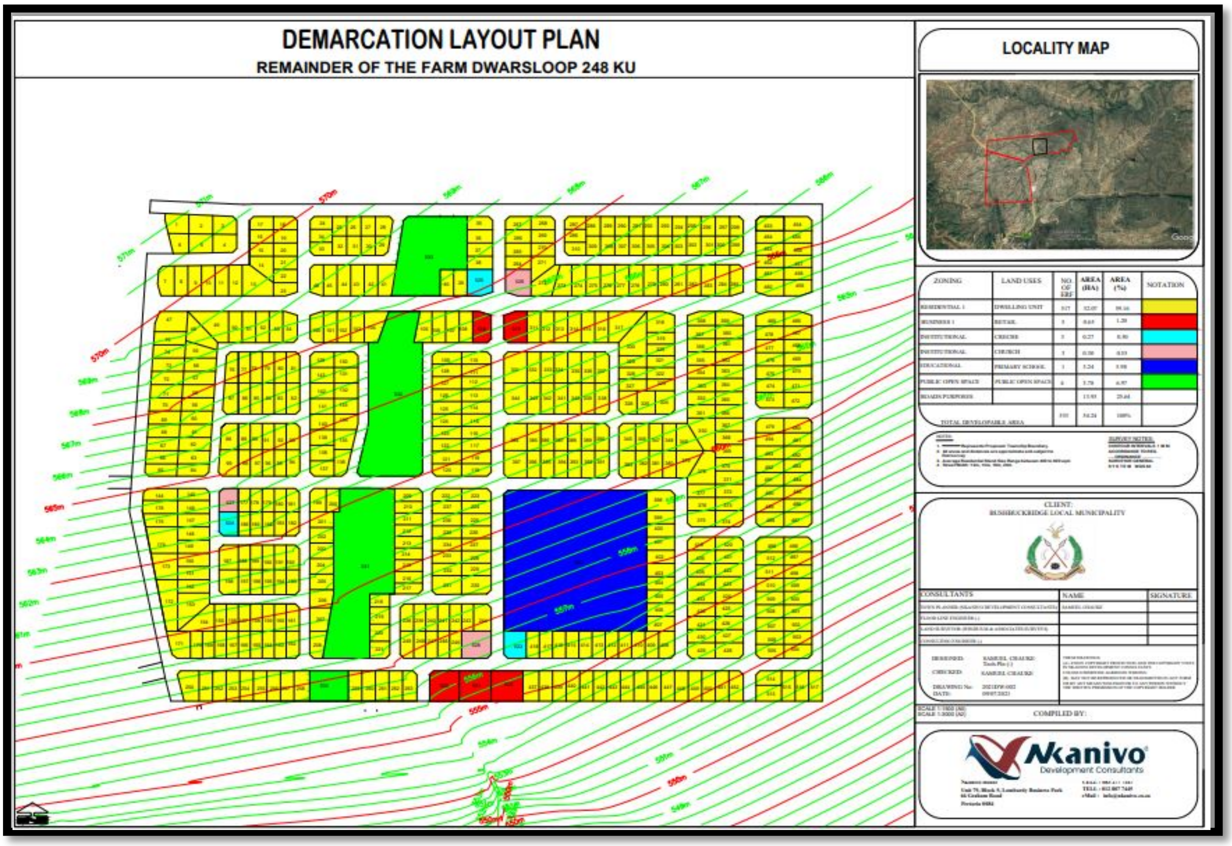


Figure 2: Layout Plan of the proposed development

4.2. Climate

The Dwarsloop can be characterised as semiarid climate which receive approximately 353mm precipitation annually. The average temperatures in Dwarsloop ranges from 29^{o}C in January and 22^{o}C is the lowest which occurs in the month of July.

The climatic conditions of the site under investigation play significant role in weathering of rocks through chemical weathering. Thus, climate is the principle player in the development of a soil profile and the weathering of rock. Weinert (1964) demonstrated that chemical decomposition is the predominant mode of rock weathering in areas where the climatic “N-value” is less than 5. In areas where the climatic N-value is between 5 and 10, disintegration is the predominant form of weathering, although some chemical decomposition of the primary rock minerals still takes place. Where the climatic N-value is greater than 10, secondary minerals do not develop to an appreciable extent and all weathering takes place by mechanical disintegration of the rock.

Weinert’s climatic N-value for the study area is less than 5. This implies that rocks are extensively weathered, often to depths of several metres, and decomposition is pronounced

4.3. Land use

The area of interest for geotechnical investigation is used for grazing of domestic animals. Site is suited adjacent to the township of Dwarsloop with a well-established residential area, schools, medical facilities and a shopping mall in less than 30 minutes' drive.

4.4. Topography

It was noted during site observation survey and actual geotechnical fieldwork procedures that the site topography is gentle in slope from the in all directions of the area of interest. This was expected since the engineering geologist conducted geological and topographic studies using ArcGISpro software prior site visit. It must also be noted that the layout plan of the proposed development as indicated in Figure 2 showed that the site is generally flat. During the investigation the proposed site was accessible by a four-wheeled drive vehicle.

5. GEOLOGY

The site under investigation falls under the cunning moor tonalite of the archaean granitic basement which is situated adjacent to the Mpuluzi Granite and Barberton greenstone belt. It must be noted that outcrops which were observed during site geological examination reveal the phaneritic texture granatoid rocks which are predominately composed of felsic minerals such as quartz, plagioclase feldspars and mafic (amphiboles and pyroxene) accessory minerals. Based on the physical properties of the rock samples and geological maps review of the site; the lithology of the site is medium to coarse grained sphene bearing tonalite. In areas where outcrops were overburden by soil; medium to coarse gravel were observed at the northern and central portion of the site while the fine sand dominant the southern lower portion of the site along Nwarhele River.

The geological map in figure 3 indicates the geological setting of the site and its surrounding.

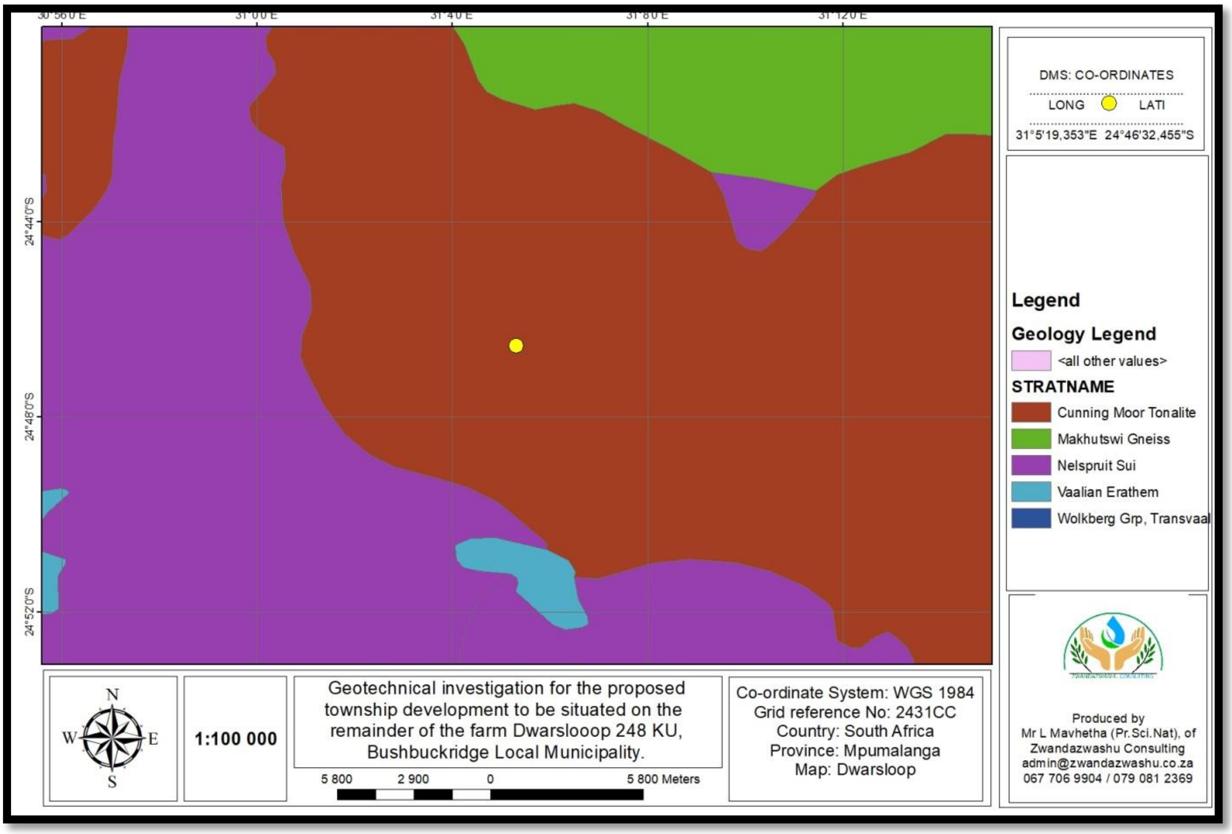


Figure 3: Geological setting of the site

6. SOIL PROFILE

Several soil strata that were encountered in the test pits during the field investigations are given below. Moreover, the summary of the test pit profiles is shown in Table 1.

Top soils

The topsoil is characterised by an upper stratum of sand which have an average thickness of 0.43m in the range 0 to 0.6m below ground level. It is characterised by non-cohesive materials typically described as “Dry to Slightly moist, greyish, intact, dense, sandy Silt.”

Reworked residual soils

Residual soil was encountered in all test pits with an average thickness of 1.18m in the range 0.3 to 1.8m below ground level.

These soils originate from the in-situ weathering of the Granitic Tonalite parent rock which is underlined cunning moor tonalite of the archaean granitic basement which is situated adjacent to the Mpuluzi Granite and Barberton greenstone belt. This stratum is typically described as “Slightly moist, light brown, intact, dense, Gravelly sand.”

Granitic (Tonalite) bedrock

The Granitic tonalite parent rock underlies the residual gravelly sand soils and was encountered in all test pits from a depth of 0.5m. The Granitic tonalite bedrock was slightly weathered. The thickness of this layer ranges from 0.5m to 2.3m

The Granitic tonilite grade varies with depth from slightly weathered medium hard rock to consolidated high strength bedrock.

Table 1: Summary of the test pit profiles

Test pits	Thickness of the layers			Water Seepage	End of hole	
	TOPSOIIL	RESIDUAL SOIL	BEDROCK		Depth (m)	Material
	Silty sand	Gravelly sand	Tornalite fragments			
TP 1	0-0.4m	0.4 - 2m	2 - 2.1m	None	2.1m	gravelly sand
TP 2	0.5m	0.5 - 1.8m	1.8 - 1.9m	None	1.9m	Gravelly sand
TP 3	0.3m	0.3 - 0.5m	0.5 - 2.2m	None	2.2m	Gravelly sand
TP 4	0.4m	0.4 - 0.9m	0.9 - 1.3m	None	1.3m	Gravelly sand
TP 5	0.55m	0.55 - 1.7m	1.7 - 1.8m	None	1.8m	Gravelly sand
TP 6	0.3m	0.3 - 0.7m	0.7- 1.6m	None	1.6m	Gravelly sand
TP 7	0.55m	0.55 - 1.2m	1.2 - 1.5m	None	1.5m	Gravelly sand
TP 8	0.4m	0.4 - 1m	1 - 1.6m	None	1.6m	Gravelly sand
TP 9	0.4m	0.4 - 1.4m	1.4 - 1.6m	1.5m	1.5m	Gravelly sand
TP 10	0.5m	0.5 - 1.6m	1.6 - 1.7m	None	1.7m	Gravelly sand
TP 11	0.4m	0.4 - 1.5m	1.5 - 1.6m	None	1.6m	Gravelly sand
TP 12	0.5m	0.5 - 2.2m	2.2 - 2.3m	None	2.3m	Gravelly sand
TP 13	0.6m	0.6 - 1.2m	1.2 - 1.5m	None	1.5m	Gravelly sand
TP 14	0.48m	0.48 - 1.1m	1.1 - 1.7m	None	1.7m	Gravelly sand
TP 15	0.4m	0.4 - 1.2m	1.2 - 1.5m	None	1.5m	Gravelly sand
TP 16	0.35m	0.35 - 1.4m	2.3m	None	2.3m	Gravelly sand
TP 17	0.48m	0.48 - 1m	1 - 1.3m	None	1.3m	Gravelly sand
TP 18	0.45m	0.45 - 1.1m	1.1 - 1.3m	None	1.3m	Gravelly sand
TP 19	0.4m	0.4 - 0.8m	0.8 - 1.2m	None	1.2m	Gravelly sand
TP 20	0.5m	0.5 - 0.95m	0.95 - 1.25m	None	1.25m	Gravelly sand
TP 21	0.3m	0.3 - 0.8m	0.8 - 1.09m	None	1.09m	Gravelly sand

TP 22	0.35m	0.35 - 1m	1 - 1.3m	None	1.3m	Gravelly sand
TP 23	0.32m	0.32 - 0.87m	0.87 - 1.35m	None	1.35m	Gravelly sand
TP 24	0.48m	0.48 - 1.1m	1.1 - 1.5m	None	1.5m	Gravelly sand
TP 25	0.4m	0.4 - 1.1m	1.1 - 1.25m	None	1.25m	Gravelly sand
TP 26	0.35m	0.35 - 0.94m	0.94 - 1.2m	None	1.2m	Gravelly sand
TP 27	0.3m	0.3 - 1m	1 - 1.55m	None	1.55m	Gravelly sand
TP 28	0.3m	0.3 - 0.8m	0.8 - 1.4m	None	1.4m	Gravelly sand

7. METHOD OF INVESTIGATION

The fieldwork was undertaken on the 12 November 2020 and comprised of the following:

- Desktop study
- Walk over survey and Pit excavation
- Test Pits
- Soil Sampling/ Laboratory Tests

7.1. Desktop Study

The desk study comprises the review of existing regional, site and surface information. Sources of information include:

- Topographic maps, geological data such as lithology of nearby rock outcrops, landforms and erosion patterns;
- Existing geotechnical reports prepared for areas in close proximity to the site;
- Data on seismic aspects, such as ground motion and liquefaction potential.

7.2. 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. A granite rock outcrops were identified during this investigation other field testing discussed below.

7.3. Inspection of Test Pits

The field investigation was conducted on the 12 November 2020. Based on the “Site Investigation Code of Practice” (SAICE Geotechnical Division, 2010), which provides standards for “acceptable engineering practice”, a total of 28 (Twenty Eight) test pits were planned for the proposed development.

This chapter of the report describes the field work and activities that were conducted in order to assess the geotechnical conditions at the proposed site. Test pits were positioned using a hand held GPS and the position of the test pits is shown on figure 3. The method of investigation was based on a near surface investigation, to a maximum depth of 2.3 m below existing ground level using fly wheel TLB (Tractor-Loader-Backhoe) in order to obtain information on the subsurface soil; each pit was marked, photographed and profiled by a field engineering geologist in accordance with the current standard procedures proposed by Brink and Bruin (2002). The test pit photographs are presented in Appendix A of this report.

These included the following components:

- Excavation of 28 (Twenty Eight) test pits with an aid of a fly wheel TLB (Tractor-Loader-Backhoe)
- Representative samples were retrieved from the test pits for laboratory testing at SANAS accredited laboratory.

Test pits were positioned using a hand held GPS, below is layout indicating the position of test pits on site.

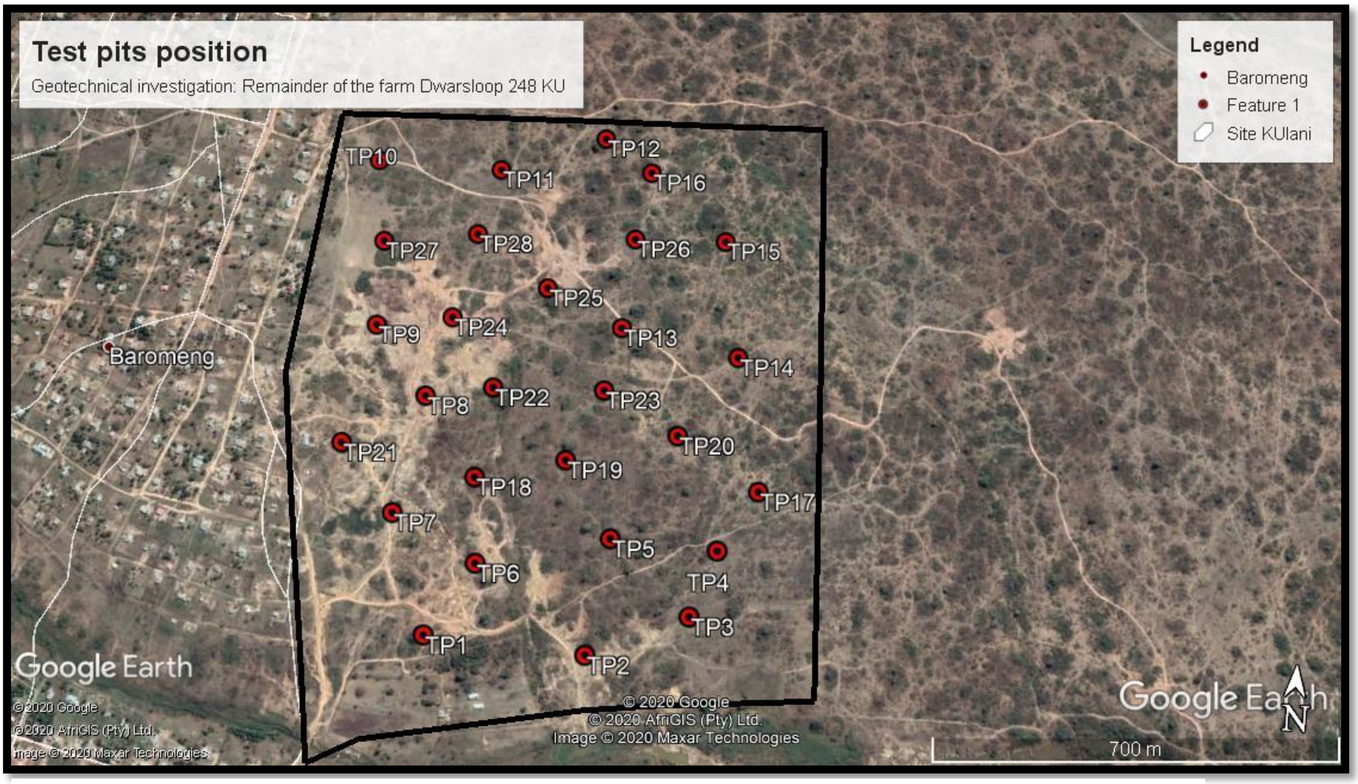


Figure 4: Test pits position

8. LABORATORY RESULTS

The field work indicated a general homogeneity of the subsurface soils comprising of Slightly moist, light brown, intact, dense, Gravelly sand, weathered granitic tonalite bedrock. Representative disturbed 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 (Booysens): 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:

- 11 Atterberg Limits (plastic limit, liquid limit and plasticity index);
- 11Grading analysis and;
- 3 MOD and 3 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 and CBR tests are presented in Appendix B and are summarized in Table 2 and Table 3 respectively. The samples were taken from the test pit position denoted in the same manner.

Topsoil Material – 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 layer has average thickness of 0.43m in the range 0 to 0.6m below ground level. It is characterised by non-cohesive materials typically described as "Dry to Slightly moist, greyish, intact, dense, sandy Silt."

Residual soils – Eleven bulk samples were collected from the Slightly moist, light brown, intact, dense, Gravelly sand. The parent Granitic tonilite rock grade varies with depth from slightly weathered medium hard rock to consolidated high strength bedrock. Homogeneity of material underlying the site was observed hence a choice of eleven bulk representative samples. The samples were found to be non-plastic. The PI along with the clay content indicated that the samples exhibit low potential expansiveness. The sample indicated CBR of 29 at 95% MOD AASHTO with a grading modulus of 1.7 for TP2, a CBR of 64 at 95% MOD AASHTO with a grading modulus of 1.5 for TP15. Based on the grading modulus, Atterberg limits and CBR the sample were classified as G6 material for TP2 and G6 for TP15 respectively.

PH and Conductivity – pH measurements conducted indicated that the pH of the area is 6.4 for TP07 at a depth of 0.55-1.2m and 5.5 for TP15 at depth of 0.4-1.2m. This pH of the site indicates more of acidic to neutral. acidic as it ranges from 5.5 to 6.4. Conductivity measurements indicated that the conductivity of the area is 0.15 Ms/m for TP07 at a depth of 0.55-1.2m, 0.003 Ms/m for TP15 at depth of 0.4-1.2m. The area can be 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 test results

Sample No.	HRB (AASHTO)	Depth (m)	Atterberg Limit			GM	Grading analysis (%)				Potential expansiveness
			LL %	LS %	PI %		Clay	Silt	Sand	Gravel	
TP01	A-2-6(0)	0.4-2	29	5.0	11	1.81	4	5	65	26	LOW
TP02	A-2-6(0)	0.5-1.8	28	4.5	12	1.74	4	8	60	28	LOW
TP3	A-2-6(0)	0.5-2.2	33	6.5	14	1.74	4	6	69	21	LOW
TP4	A-2-4(0)	0.4-0.9	-	-	NP	1.33	6	8	79	7	LOW
TP06	A-2-6(0)	0.3-0.7	29	5.5	13	1.64	5	8	72	15	LOW
TP07	A-2-4(0)	0.55-1.2	22	5.0	10	1.2	7	14	68	11	LOW
TP09	A-2-6(0)	0.4-1.4	27	6.0	14	1.26	9	8	82	1	LOW
TP11	A-1-b(0)	0.4-1.5	-	-	NP	1.46	3	7	79	11	LOW
TP12	A-2-4(0)	0.5-2.20	20	3	7	1.54	5	10	70	15	LOW

TP15	A-1-b(0)	0.4-1.2	-	-	NP	1.49	4	6	79	11	LOW
TP16	A-1-b(0)	0.35-1.4	-	-	NP	1.81	2	8	57	33	LOW

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^3)**	**COLTO Classification**
			90 %	**93%**	**95%**	**97%**	**98%**	**100%**					
TP2	A-2-6(0)	0.5-1.8	20	25	29	34	37	43	1.7	0.5	8.4	2043	G6
TP7	A-2-4(0)	0.55-1.2	2	3	4	4	5	6	1.2	1.3	8.2	2071	-
TP15	A-1-b(0)	0.4-1.2	32	48	64	84	97	128	1.5	0.2	5.2	2174	G6

PI: Plasticity Index **GM:** Grading Modulus **OMC:** Optimum Moisture Content **CBR: California** Bearing Ratio

9. HYDROGEOLOGY

9.1. Drainage patterns

Drainage, particularly during periods of heavy or prolonged rainfall is currently channelled by a valley (tributary) that divides the site at the centre from north to south and discharge the water to Nwarhele River. There is no storm water drainage systems observed on site. Site drainage 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.

Absolutely no ponding of water should be permitted on the site expect on natural water bodies on site. All storm water from downpipes and gutters from buildings and structures shall discharge onto concrete-lined channels which, in turn, shall discharge the water at least 1.5 m away from structures onto areas permitting surface drainage away from buildings and structures. Joints between any open channel drains and buildings shall be suitably sealed.

9.2. Ground water

Groundwater may negatively affect structures founded on non-cohesive soil (sands and gravel). It has been shown that when non-cohesive soils become saturated, their stiffness, vertical stress and effective confining stress are reduced resulting in lower bearing pressures of the soil. Furthermore, a shallow/perched groundwater table normally presents a problem of rising damp on structures. Considering that the site is predominantly underlined by non-cohesive medium to coarse gravel and silty sand the above outlined engineering challenges must be taken into cognisance during construction especially in TP9 where water-table was encountered at a depth of 1.5 meter below the ground level.

Therefore, appropriate remedial measures such as damp proofing needs to be incorporated in the construction of structures in areas where a shallow/ perched water table is anticipated. Various Pedogenic soils (ferricrete/silicrete and signs of ferruginisation/silification) may indicate fluctuating or seasonally perched water table commonly caused by retarded vertical infiltration and percolation rates.

Groundwater and groundwater seepage were not encountered in all 28 test pits excavated on the site. The site is mainly underlain by non-cohesive soil (medium to coarse gravel and silty sand) with moderate drainage characteristics. Although groundwater was not encountered during the current site investigation except in TP9, groundwater level is subject to seasonal fluctuation. Therefore, measures such as damp proofing and subsurface drainage should be considered on site because of the non-cohesive nature of the material onsite.

10. GEOHAZARDS

10.1. Seismic activities

Seismic-hazard can be described as being the physical effects of an earthquake or earth tremor. Examples of such phenomenon include surface faulting, ground shaking and liquefaction (Kijko A et al, 2004). According to the published (Council for Geosciences) Seismic Hazard Identification Maps of South Africa, Site falls under an area with a 10 % probabilistic of >0.12g (peak ground acceleration) being exceeded in a 50 year period. The peak ground acceleration is the maximum acceleration of the ground shaking during an earthquake.

For masonry and concrete structures, a 4 to 5 Hz Spectral Acceleration is assumed. This natural frequency of the structure can give an indication of the spectral part of the earthquake motion time history that has the capacity to introduce energy into the structure. Spectral Acceleration (ARS – acceleration-response spectra) is the movement experienced by the structure during an earthquake / seismic event.

This phenomenon is known as resonance. Resonance is where the frequency of the applied harmonic force is consistent with the natural frequency of a vibrating body. At resonance, the vibrating body will exhibit the maximum amplitude of response displacement leading to extremely high structural distress similar to popular example of the Tacoma Narrows Bridge that was situated in Washington State, near Puget Sound. Therefore, frequencies far away - either lower or higher - from the natural frequency of the structure have little capability of damaging the structure.

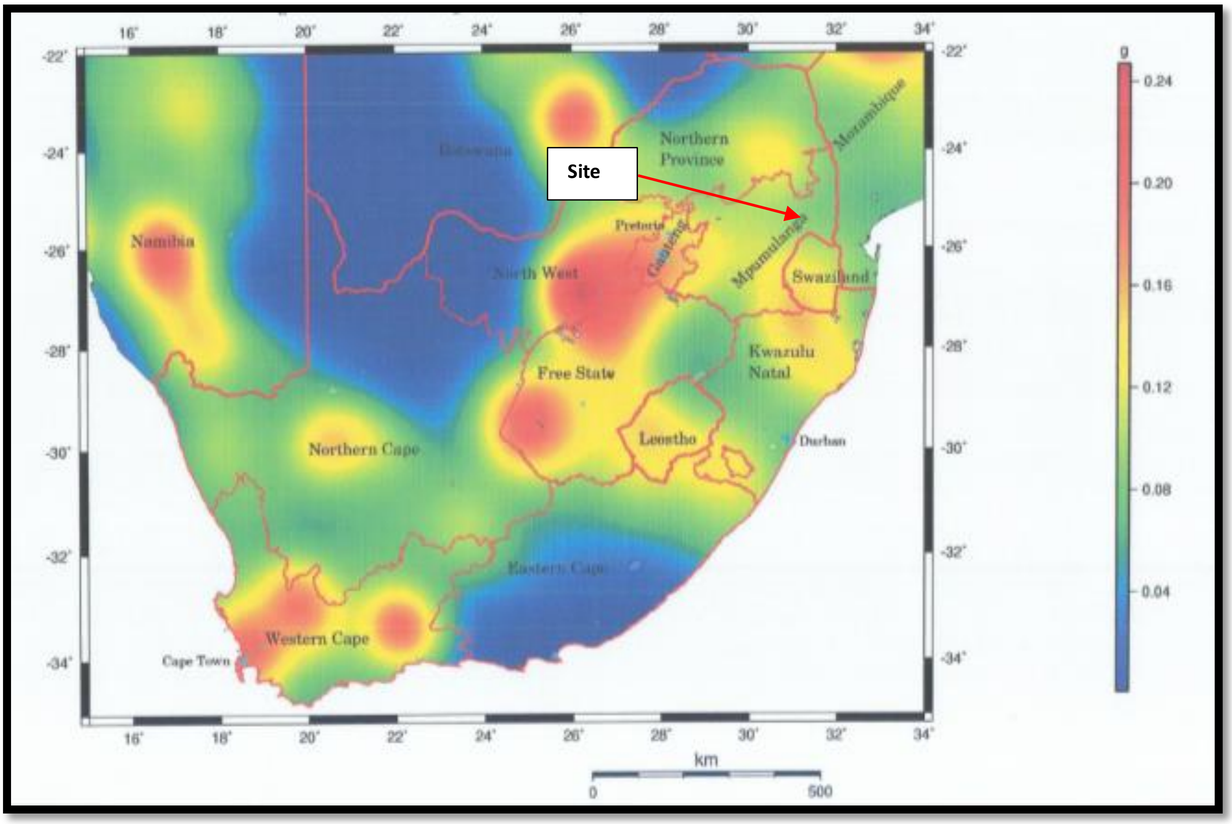


Figure 5: Seismic hazard map of South Africa

Seismic hazard maps of South Africa produced by Kijko (2003), show the site is situated in the area where the peak ground acceleration is greater than 10% probability of exceedance in a 50-year period is approximately 0.12 to 0.20g. This area is a low seismic hazard area and the construction materials to be used (gravel) are in harmony with the naturally occurring site conditions. As a result, no major problems are foreseen in this regard.

Two types of seismic activities occur in South Africa, namely:

- Regions of natural seismic activity (Zone I), and
- Regions of mining-induced and natural seismic activity (Zone II).

In accordance with the seismic hazard zones contained in SANS 10160-4 (2011), the site does not fall within either Zone I or Zone II, as shown in **Figure 6**.

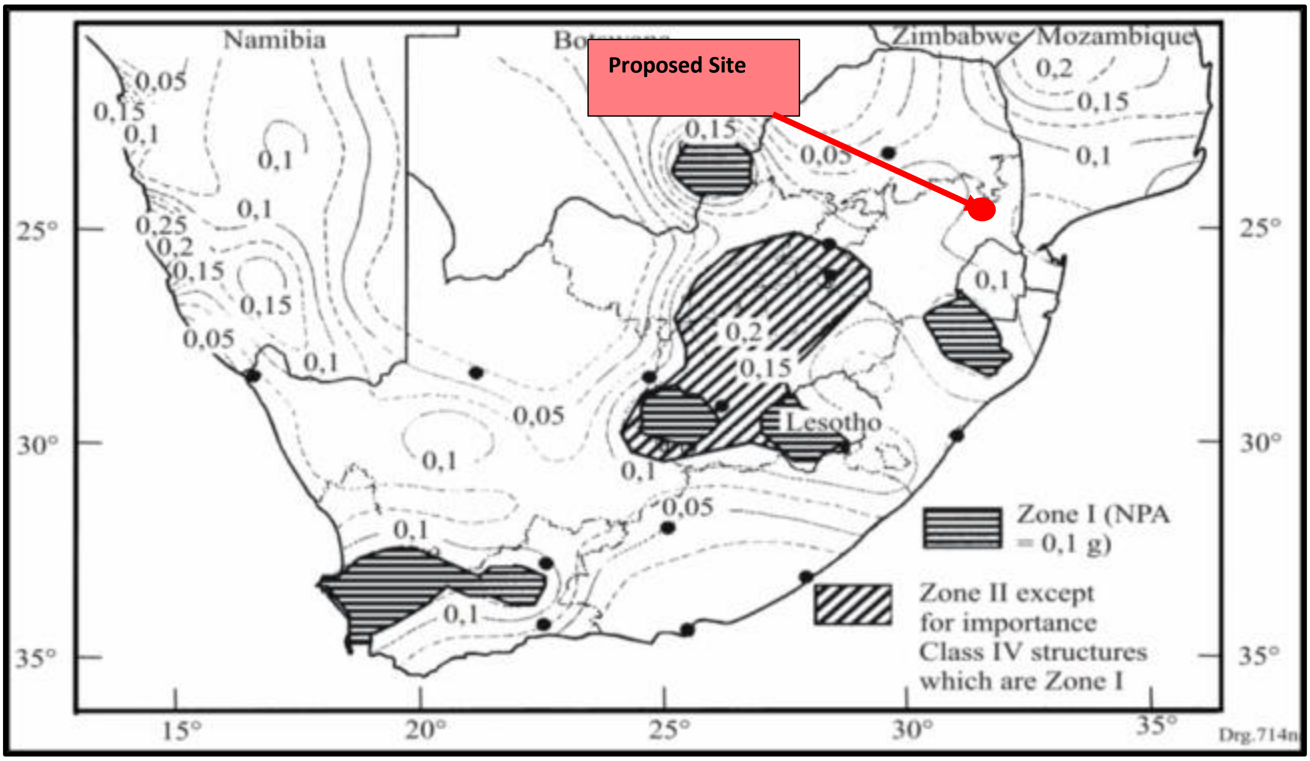


Figure 6: Siesmic Hazard Zones of South Africa (SANS 10160-4, 2011)

10.2. Ground subsidence

Subsidence occurs in areas with large underground cavities (natural occurring or anthropogenic) typically resulting from large scale shallow to very shallow mining and also from Dolomite/Limestone dissolution. It can also appear where high thickness of unconsolidated material exists.

This site showed no signs of previous subsidence occurrences. Furthermore, there is no evidence or record of active underground mining in the immediate vicinities that might cause drop in the ground water level thus triggering ground subsidence. The site is a not a dolomitic land, so it cannot be subject to doline formation. Information obtained from Council of Geoscience shows that the site is not underlain by dolomite rock at surface or at depth (<100m). The site is therefore not classified as dolomitic land and is not at risk in terms of dolomite related surface subsidence. Generally, soluble rock, such as limestone or dolomite was not found on the site and no instability associated with this rock type is anticipated.

10.3. Sinkhole formation

Similar to subsidence, sinkhole formation happens in areas with very large to extremely large underground cavities resulting from mining poorly designed shallow underground activities. Coal Mines in Mpumalanga Province and Gold Mines in Limpopo Province are typical examples of such calamity. Dissolution of dolomites or limestone over millions of years also lead to cavity formations that might later manifest into sinkhole formation as evidenced very much so in Limpopo and Gauteng Provinces.

According to the research done, there are no records of wide shallow underground mining activities directly below this site. There is no dolomite or limestone underlying the site so the chances of dolomite related sinkhole formation are unlikely.

10.4. Landslides and mudslides

The probability of landslides and mudslides occurring at this area are rare. This is primarily due to the climatic conditions and composition of residual and transported materials in this particular area. Also, this is primarily due to the low relief and relatively flat gradient of the area.

10.5. Volcanic activities

South Africa has seen its last volcanic activity approximately 65 million years ago during the massive historical eruption of the Drakensberg Lava forming the Basaltic Drakensberg Mountain Ranges that we see today. Recent studies showed no signs for the possibility of volcanic eruption in the foreseeable future

11. 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 6 gives the basis of the soil site classification that was applied during the investigation and Table 7 gives the geotechnical classification for urban development

Table 4: Residential site class designations

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

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.

11.1. Expansive soils

Active/expansive soils are defined as fine grained soils (generally with high clay content) that change in volume in response to the change in moisture content. These soils may increase in volume (heave/swell) upon wetting and decrease in volume (shrink) upon drying out. These soils are classified as (H) according to the SAICE site classes. Depending on the severity of the predicted movement, expansive soils can be classified as H, H1, H2 or H3 (Table 4).

The site is predominately underlain by gravelly sand> silt >with low content of clay. The laboratory results of all the samples analyzed exhibit a low potential expansiveness. The site is therefore classified with the soil site class **H** according to the SAICE site classification system.

11.2. Collapsible soils

Collapsible soils are defined as soils that have a potential for collapse and are commonly open textured with a high void ratio (Brink, 1985). These soils are typically silty sands, sands, sandy and gravelly soils commonly found in colluvial and aeolian sands. Soils which exhibit potentially collapsible characteristics are classified with the soil site class ‘C’ according to the SAICE site classification system (Table 4).

The soils encountered on the site typically comprise of gravelly sand with no visual open-textured structures such as voids and pinholes which indicate collapse potential. Due to the crumbly nature of the soils on site, undisturbed soil samples could not be retrieved for collapse potential testing. From the site observations it is anticipated that the site will exhibit low collapse potential. Therefore, the **site is classified as site class C** according to the GFSH-2 classification.

11.3. Compressible soils

Compressible soils are soils in which the bulk volume of the soil may gradually decrease with time when subjected to an applied load. These soils typically comprise fine grained soils such as clay, clayey sand and clayey silt with low plasticity, gravelly and sandy soil. According to the SAICE soil site class these soils are denoted as class ‘S’ and may very (S, S1, S2) depending on the severity of the bulk volume change (Table 4).

The site is generally underlain by non-cohesive soils with low – medium plasticity index. The laboratory results indicate that the samples have a low clay content and high silt content.

The site is therefore classified with the soil site class **S** according to the SAICE site classification system.

11.4. Soil site classification

A review of the test pit data indicates that the site is generally underlained by granitic tonalite bedrocks. The laboratory tests indicated that material underlying the site exhibits low 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. From the above discussion the site is classified into main soil area namely compressible and potential collapsible soils: According to AASHTO and COLTO the soil samples were classified as A-2-6(0) and G6 respectively. **The foundation design options as per SANS10400 H- NHBRC soil symbol is "R/C/H". The recommended Foundation types in accordance with** SANS 10400H- Modified normal / Reinforced Deep Strip Foundation

11.5. Excavation Classification

The in-situ soils and slightly weathered granitic tonalite bedrock were excavated to an average depth of 1.6m below ground level.

Based on the test pits excavations, it is anticipated that site should classify as "soft excavation" to an average depth of 1m, in accordance with SANS 1200 DA classification using similar plant as employed during this investigation. This means it can easily be removed by a tractor loader backhoe (TLB) of flywheel power >0.10 kW per mm of tined bucket width.

Allowance should be made for "intermediate to hard excavation" where deeper excavations are required from a depth 1 m where there's a granitic tonalite bedrock.

11.6. Stability of excavations sidewalls

It was noted during trail pit excavations that the sidewalls retain its initial condition without crumbling. This is a good indication for the behaviour of the materials; excavated ground must retain its stature vertically without unsupported.

For safety reasons, sidewalls of excavations deeper than 1.5 m should be battered back to 1:1 in dry conditions. Should oblique jointing or any seepage be noted, then the sidewalls may need to be battered at a much flatter gradient. This is only acceptable for excavation depths restricted to less than 3.0 m. All safety precautions should be adhered to. Should battering be deemed unpractical due to some site conditions, sidewalls should be supported by suitably designed shoring technique.

11.7. Construction material suitability

The aim of this geotechnical site investigation report was to determine the different engineering geological properties of the surface and subsurface soils in accordance with the GFSH–2 guidelines, NHBRC. The intention is to be able to recommend for the founding levels for the foundation design for the proposed township establishment to be situated on the remainder of the farm Dwarsloop 248 KU, and Mpumalanga Province of South Africa. The soil was mainly composed of compressible soils; hence it was found to be of low plastic behavior. This soil was classified as G6 according to COLTO Classification. Furthermore, the materials are ideal for construction.

11.8. Construction Monitoring

It is recommended that all foundations be inspected by a competent person prior to placing any concrete and regular checks on the quality and compaction of the backfill to the terraces should be made.

12. PRELIMINARY RECOMMENDATIONS

12.1. Foundations

It is important to note that foundation recommendations are subject to confirmation of laboratory test results. Based on site conditions and evaluation described in section 7, 8 & 9 the following foundation types are provisionally recommended.

12.1.1. Foundations on residual soils

Residual soils were encountered at various, uneven depths ranging from 0.3 to 1.8m below the ground level.

Therefore, the recommended foundation type is a ***reinforced strip foundation founded on a G6/G7 engineered soil mattress***. Reinforcement should be designed by a competent person. The following construction procedures apply.

- All topsoil to be stripped to spoil;
- Foundation trenches for 500mm wide strip footing to be over-excavated to 1.0m wide by 1.6m deep below existing ground level;

- Excavation to be backfill with G6 quality material to a depth of 0.6m existing ground level;
- G6 material to be compacted in 150mm thick layers to 93% Mod AASHTO density at –1% to +2% OMC;
- Strip footings 500mm wide and adequately reinforced should be constructed at a depth of 0.6m;
- The allowable bearing capacity should be limited to 150kPa on the engineered soil mattress;
- Articulation joints at some internal doors and all external doors;
- Light reinforcement in masonry;
- Good site drainage requirements.

12.2.2. Foundations on weathered Granitic tonalite

The medium hard rock granitic tonalite is encountered at a depth of 1.09m below existing ground level. The recommended foundation type is a ***normal strip foundation*** onto the medium hard rock granitic tonalite. The following construction procedures apply:

- All topsoil to be stripped to spoil;
- Foundation excavation to the moderately weathered, highly fractured, medium hard rock at an average depth of 1m below existing ground level;
- The excavation onto the weathered Granitic tonalite to be hand cleaned and all loose material to be removed;
- A concrete blinding to be cast to onto cleaned rock surface prior to casting foundations;
- The allowable bearing capacity should be limited to 300kPa on the weathered Granitic tonalite bedrock.

13. CONCLUSIONS

From the above discussion, the following conclusions may be drawn:

- The area investigated is underlain by top soils of sand, including residual soils derived from the in-situ weathering of granitic tonalite bedrock.

- Residual Granite tonalite is well developed and were encountered in the entire site from the depth of 1m below existing ground level.

- The excavation on site is likely to classify as “soft” to an average depth of 1m below existing ground level. Below this, “intermediate to hard” excavation is expected.

- Foundation recommendations include ***reinforced deep strip foundations*** on the residual soils on an engineering soil mattress and a ***normal strip foundation*** onto the medium hard rock granitic tonalite.

14. REPORT PROVISIONS

This investigation is aimed at providing the engineers with an indication of the prevailing geological and geotechnical conditions in the study area, with reference to the proposed township establishment to be situated on the remainder of the farm Dwarsloop 248 KU, Mpumalanga Province.

While every effort has been made during the fieldwork investigation to identify the various soil horizons, their problems and distribution, it is impossible to guarantee that isolated zones of varying material have not been missed. The investigation was, however, thorough and conditions are not expected to vary a great deal from that described in this report.

The engineers are, nevertheless, strongly urged to inspect all excavations to assure themselves that conditions are not at variance with those described in this report.

Please note:

- Test pits were backfilled after the field investigation but were not re-compacted.
- Some test pits positions occur within the footprints of proposed structures.
- The recommendations provided in this report are provisional and a final interpretive geotechnical report will be prepared when these become available.

15. REFFERENCE

Brink, A.B.A and Bruin R.M.H, (2002). **Guidelines for soil and rock logging in South Africa**, Second Impression, Proceedings of the Geoterminology Workshop.

Brink A.B.A. **Engineering Geology of Southern Africa.** Volume 3. The Karoo Sequence. Building publications Pretoria. ISBN 0908423152

Committee of Land Transport Officials (COLTO), Draft TRH4:1996 **Structural Design of Flexible Pavements for Interurban and Rural Roads**.

Jennings J.E., Brink A.B.A. and Williams A.A.B. (1973) Revised **Guide to Soil Profiling for Civil Engineering Purposes in South Africa**. The Civil Engineer in South Africa, January 1973.

IH Braatveld, JP Everett, G Byrne, K Schwartz, EA Friedlaender, N Mackintosh and C Wetter. **A guide to practical Geotechnical Engineering in Southern Africa** by FRANKI

Partridge, T C, Wood, C K, and Brink, A B A, "**Geotechnical Constraints for Urban Development**". 1993

South African Institution of Civil Engineering (SAICE) – Geotechnical Division. **Site investigation code of practice**. 1st Ed, 2009.

The South African Bureau of Standard, **Standardised Specification of Civil Engineering Construction**, SABS 1200 D_1988

16. REPORT SIGNATURE

Geotechnical site investigation report prepared by;

Zwandazwashu Consulting Pty (Ltd) (2019/047314/07)

Unit 01A Stanford Business Park

817 16th Road, Randjespark

Midrand

1685

Cell: 079 081 2369 / 067 706 9904

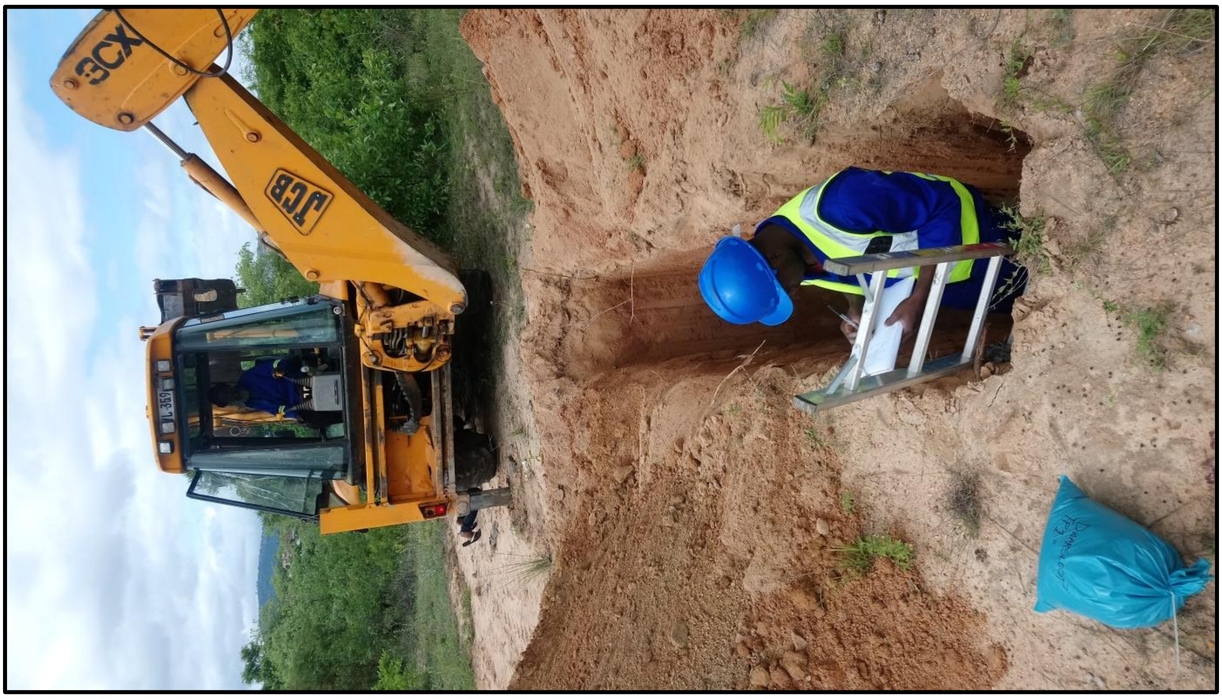
Compiled by: Neduvhuledza Nduvho (Cand.Nat.Sci) SACNAPS Registration No:

120301 Reviewed by: Mavhetha Lavhelesani (GSSA Member) Registration No: 970200

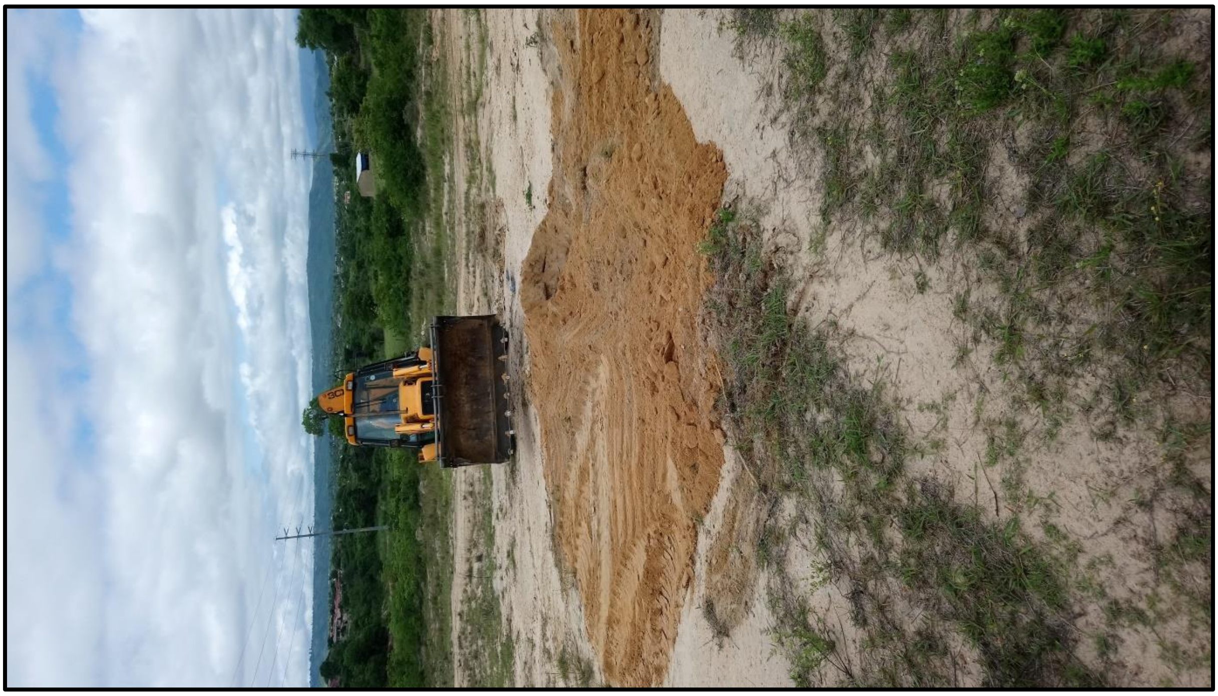
(Pr.Nat.Sci) SACNAPS Registration No: 126057

Signature of Mr. Mavhetha L

APPENDIX A: THE SITE PHOTOS


3CX
JCB


3CX
JCB



APPENDIX B: LABORATORY REULTS

Client : NKANIVO DEVELOPMENT CONSULTANTS (COO
Address : P O BOX 11948
: SILVER LAKES
: 54

Client Reference :
Order No. : Samuel

Attention :
Facsimile :
E-mail : info@nkanivo.co.za

Date Received : 17/11/2020
Date Tested : 17/11/2020 - 02/12/2020
Date Reported : 02/12/2020

Project : Dawrsloop 248KU
Project No. : 2020-B-1504

Report Status : Final
Page : 1 of 14

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)
Moisture Density Relationship	3.000	SANS 3001 GR30	S Pullen	10-12
pH of Soil *	2.000	TMH1 A20	J Marques	2-3
Conductivity of saturated soil paste *	2.000	TMH1 A21T	J Marques	2-3
Atterberg Limits <0.425mm	11.000	SANS 3001 GR10	S Pullen	4-9, 13-14
Sieve Analysis 0.075mm	11.000	SANS 3001 GR1	J Marques/S Pullen/B Mvubu	4-9, 13-14
California Bearing Ratio (CBR)	3.000	SANS 3001 GR40	B Mvubu	13-14
Hydrometer Analysis	11.000	SANS 3001 GR3	J Marques/S Pullen/B Mvubu	4-9

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.

This report is completely confidential between the parties (Civilab and Civilab`s client) and shall not be disclosed to anybody else, unless agreed upon in writing or made publicly available by the client or required to make available by law.

Deviations in Test Methods:

Technical Signatory:	
Signature:	

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

Client	:	NKANIVO DEVELOPMENT CONSULTANTS (COO	Date Received:	17/11/2020
Project	:	Dawrsloop 248KU	Date Reported:	02/12/2020
Project No	:	2020-B-1504	Page No. :	2 of 14

AGGREGATE TEST REPORT

Laboratory Number		6
Field Number		TP7
Client Reference		
Depth (m)		0.55-1.20
Position		
Coordinates	X	
	Y	
Description		
Additional Information		
Calcrete/Crushed		
Stabilizing Agent		

	% Passing		mm	
			mm	
			mm	
			mm	
			mm	
			mm	
			mm	
			mm	
			mm	
			mm	
			mm	
			mm	
			mm	
			mm	
			mm	
			mm	
			mm	
			mm	
			mm	
Sand Equivalent, Se				
pH				6.4
Relative Density of Soils				
Durability Mill Index				
Moisture Content			%	
Compactibility Factor				
Conductivity			$S.m^{-1}$	0.015
Total Water Soluble	Salts		%	
	Sulphates			
Soluble	Salts		%	
	Sulphates			
Soundness	Fine		%	
	Coarse			
	Fractions		No.	
Methylene Blue Absorption				
Soluble Deleterious Impurities			%	
Chloride Content			%	
Low Density Material			%	
Presence of Sugar				
Mill Abrasion				
Treton Value				
Vialit Adhesion @	5°C		%	
	25°C		%	

Finess Modulus				
Clay Content		SANS 3001 GR3	%	7
Organic Impurities			Ref.	
Flakiness Index	Total		%	
Average Least Dimension	Manual		mm	
	Machine			
	Computation			
Aggregate Crushing Value	Dry		%	
	Wet			
	Eth. Glycol			
10% Fines Aggregate Crushing Test (FACT)	Dry		kN	
	Wet			
	Eth. Glycol			
	Wet/Dry Ratio		%	
Bulk Density	Loose		kg/m^3	
	Compacted			
Water Absorption			%	
Bulk Particle Density			kg/m^3	
	Aggregate			
Apparent Particle Density			kg/m^3	
	Adjusted			
	Relative			
LA Abrasion	1000 Revs		%	
	500 Revs			
Riedel & Weber				
Akali Silica Reaction			%	
Drying Shrinkage			%	
Wetting Expansion			%	
Fractured Faces			%	
Coarse Sand Ratio			%	
Shape: Voids			%	
Shell Content			%	
Durability	Ballast			
Eth. Glycol Durability on _ Stone	Concrete			
	Crushed			
	Seal			

Client	:	NKANIVO DEVELOPMENT CONSULTANTS (COO	Date Received:	17/11/2020
Project	:	Dawrsloop 248KU	Date Reported:	02/12/2020
Project No	:	2020-B-1504	Page No. :	3 of 14

AGGREGATE TEST REPORT

Laboratory Number		10
Field Number		TP15
Client Reference		
Depth (m)		0.40-1.20
Position		
Coordinates	X	
	Y	
Description		
Additional Information		
Calcrete/Crushed		
Stabilizing Agent		

	% Passing		mm		Finess Modulus				
			mm		Clay Content		SANS 3001 GR3	%	4
			mm		Organic Impurities			Ref.	
			mm		Flakiness Index	Total		%	
			mm						
			mm						
			mm		Average Least Dimension	Manual		mm	
			mm			Machine			
			mm			Computation			
			mm		Aggregate Crushing Value	Dry		%	
			mm			Wet			
			mm			Eth. Glycol			
			mm		10% Fines Aggregate Crushing Test (FACT)	Dry		kN	
			mm			Wet			
			mm			Eth. Glycol			
			mm			Wet/Dry Ratio		%	
			mm		Bulk Density	Loose		kg/m^3	
			mm			Compacted			
			mm		Water Absorption			%	
Sand Equivalent, Se									
pH				5.5	Bulk Particle Density			kg/m^3	
Relative Density of Soils									
Durability Mill Index						Aggregate			
Moisture Content			%		Apparent Particle Density			kg/m^3	
Compactibility Factor									
Conductivity			S.m^{-1}	0.003					
Total Water Soluble	Salts		%			Adjusted			
	Sulphates					Relative			
Soluble	Salts		%		LA Abrasion	1000 Revs		%	
	Sulphates					500 Revs			
Soundness	Fine		%		Riedel & Weber				
	Coarse				Akali Silica Reaction			%	
	Fractions		No.		Drying Shrinkage			%	
Methylene Blue Absorption					Wetting Expansion			%	
Soluble Deleterious Impurities			%		Fractured Faces			%	
Chloride Content			%		Coarse Sand Ratio			%	
Low Density Material			%		Shape: Voids			%	
Presence of Sugar					Shell Content			%	
Mill Abrasion					Durability	Ballast			
Treton Value					Eth. Glycol	Concrete			
Vialit Adhesion @	5°C		%		Durability on	Crushed			
	25°C		%		_ Stone	Seal			

Client	:	NKANIVO DEVELOPMENT CONSULTANTS (COO	Date Received:		17/11/2020
Project	:	Dawrsloop 248KU	Date Reported:		02/12/2020
Project No	:	2020-B-1504	Page No.	:	4 of 14

FOUNDATION INDICATOR

Laboratory Number		1 ◆	2 ■
Field Number		TP1	TP2
Client Reference			
Depth (m)		0.40-2.00	0.50-1.80
Position			
Coordinates	X		
	Y		
Description			
Aditional Information			
Calcrete / Crushed			
Stabilizing Agent			

Moisture Content & Relative Density

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

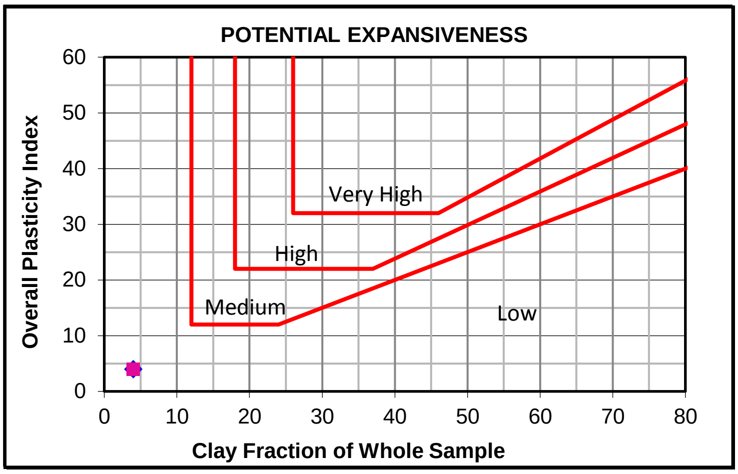
Sieve Analysis (Wet Prep) **SANS 3001 GR1**

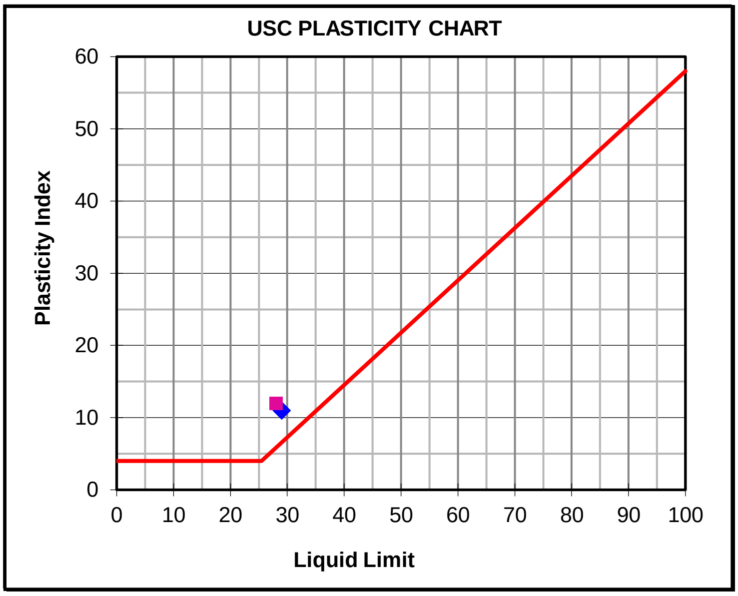
Percentage Passing	100 mm	100	100
	75 mm	100	100
	63 mm	100	100
	50 mm	100	100
	37.5 mm	100	100
	28 mm	100	100
	20 mm	100	100
	14 mm	100	97
	5 mm	93	89
	2 mm	74	72
	1 mm	51	52
	0.425 mm	32	35
	0.250 mm	24	28
	0.150 mm	19	23
	0.075 mm	13	19
Grading Modulus		1.81	1.74

Hydrometer Analysis **SANS 3001 GR3**

Percentage Passing	0.060 mm	9	12
	0.040 mm	8	10
	0.020 mm	6	8
	0.006 mm	5	4
	0.002 mm	4	4
Gravel	%	26	28
Sand	%	65	60
Silt	%	5	8
Clay	%	4	4

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





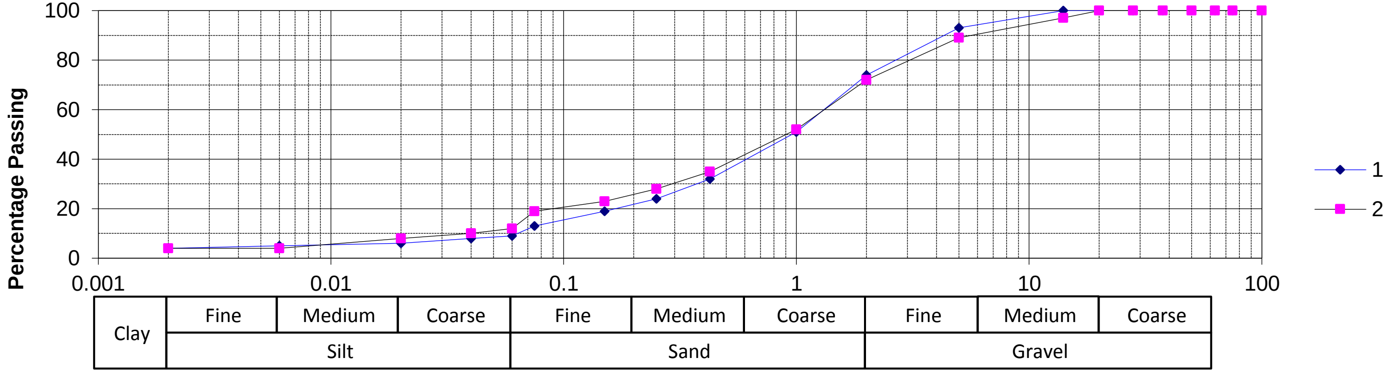
Laboratory Number		1 ◆	2 ■

Atterberg Limits -425µ **SANS 3001 GR10**

Liquid Limit	%	29	28
Plasticity Index	%	11	12
Linear Shrinkage	%	5.0	4.5
Overall PI	%	4	4

Classifications

HRB (AASHTO)	A-2-6(0)	A-2-6(0)
Unified (ASTM D2487)	SC	SC
Weston Swell @ 1 kPa		



Client	:	NKANIVO DEVELOPMENT CONSULTANTS (COO	Date Received:	17/11/2020
Project	:	Dawrsloop 248KU	Date Reported:	02/12/2020
Project No	:	2020-B-1504	Page No. :	5 of 14

FOUNDATION INDICATOR

Laboratory Number		3 ◆	4 ■
Field Number		TP3	TP4
Client Reference			
Depth (m)		0.50-2.20	0.40-0.90
Position			
Coordinates	X		
	Y		
Description			
Aditional Information			
Calcrete / Crushed			
Stabilizing Agent			

Moisture Content & Relative Density

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

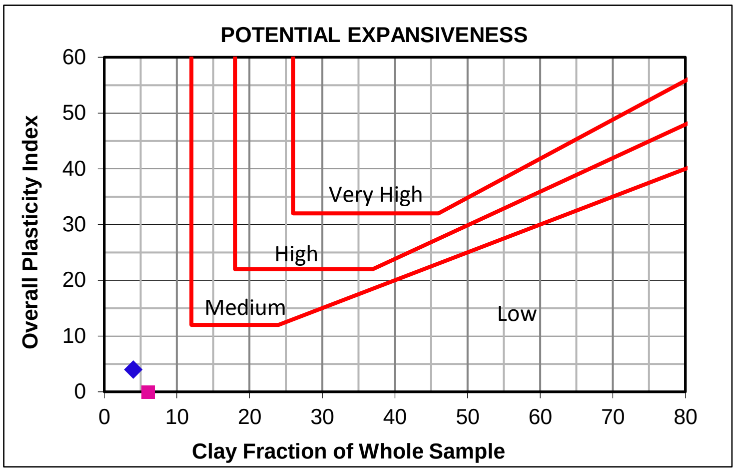
Sieve Analysis (Wet Prep) **SANS 3001 GR1**

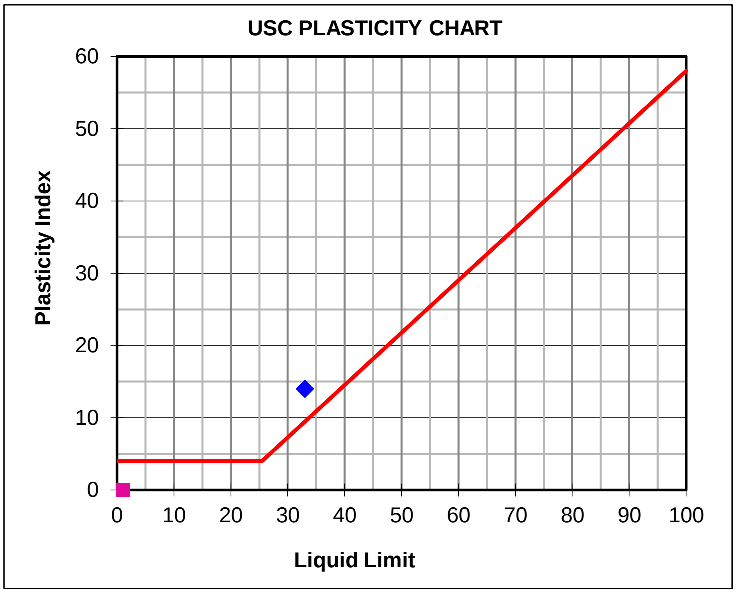
Percentage Passing	100 mm	100	100
	75 mm	100	100
	63 mm	100	100
	50 mm	100	100
	37.5 mm	100	100
	28 mm	100	100
	20 mm	100	100
	14 mm	100	100
	5 mm	99	99
	2 mm	79	93
	1 mm	50	74
	0.425 mm	30	52
	0.250 mm	24	40
	0.150 mm	19	30
	0.075 mm	17	22
Grading Modulus		1.74	1.33

Hydrometer Analysis **SANS 3001 GR3**

Percentage Passing	0.060 mm	10	14
	0.040 mm	9	11
	0.020 mm	7	9
	0.006 mm	5	6
	0.002 mm	4	6
Gravel	%	21	7
Sand	%	69	79
Silt	%	6	8
Clay	%	4	6

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

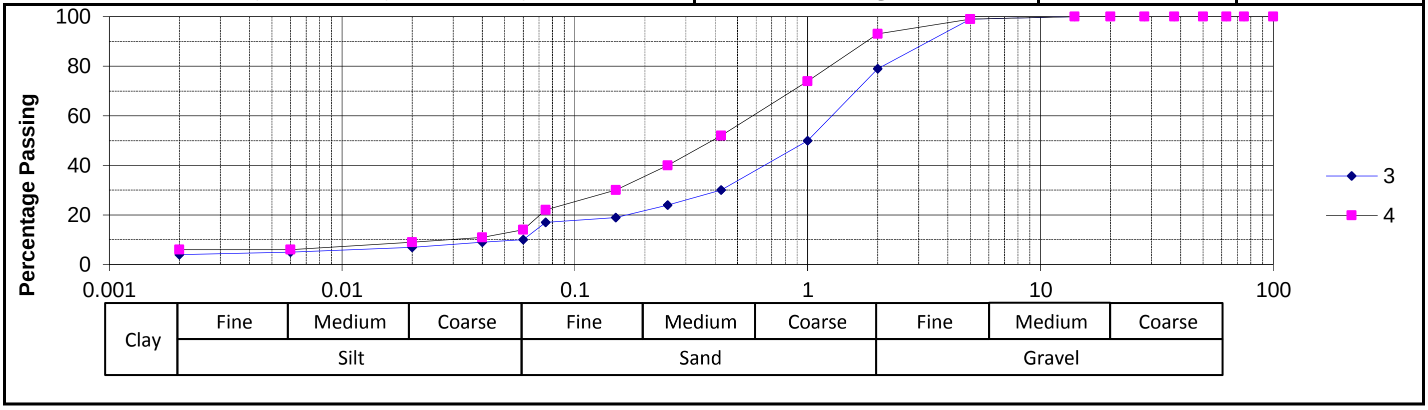




Laboratory Number		3 ◆	4 ■
Atterberg Limits -425µ		**SANS 3001 GR10**	
Liquid Limit	%	33	
Plasticity Index	%	14	NP
Linear Shrinkage	%	6.5	
Overall PI	%	4	

Classifications

HRB (AASHTO)	A-2-6(0)	A-2-4(0)
Unified (ASTM D2487)	SC	SM
Weston Swell @ 1 kPa		



Client	:	NKANIVO DEVELOPMENT CONSULTANTS (COO	Date Received:	17/11/2020
Project	:	Dawrsloop 248KU	Date Reported:	02/12/2020
Project No	:	2020-B-1504	Page No. :	6 of 14

FOUNDATION INDICATOR

Laboratory Number		5 ◆	6 ■
Field Number		TP6	TP7
Client Reference			
Depth (m)		0.30-0.70	0.55-1.20
Position			
Coordinates	X		
	Y		
Description			
Aditional Information			
Calcrete / Crushed			
Stabilizing Agent			

Moisture Content & Relative Density

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

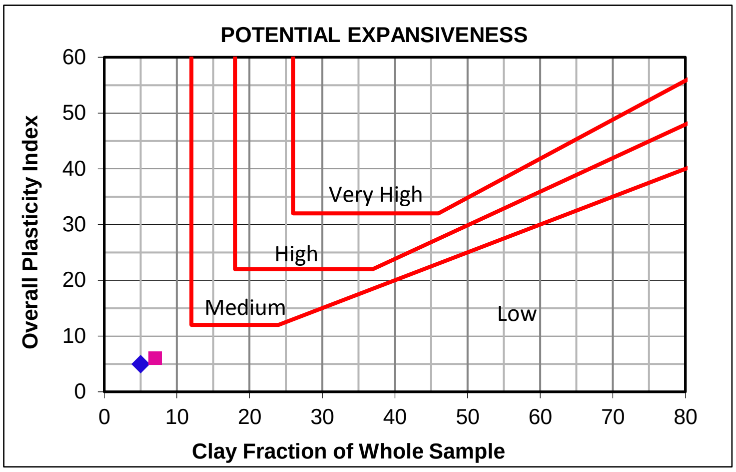
Sieve Analysis (Wet Prep) **SANS 3001 GR1**

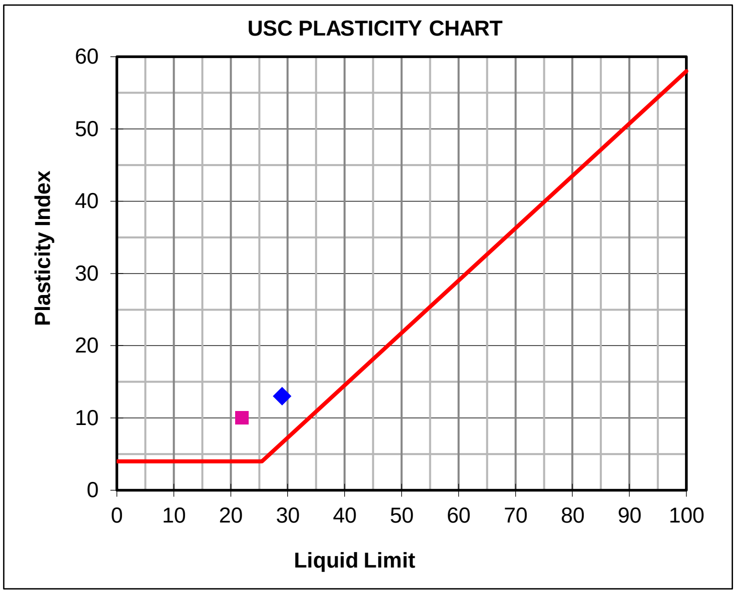
Percentage Passing	100 mm	100	100
	75 mm	100	100
	63 mm	100	100
	50 mm	100	100
	37.5 mm	100	100
	28 mm	100	100
	20 mm	100	100
	14 mm	100	99
	5 mm	96	95
	2 mm	85	89
	1 mm	65	78
	0.425 mm	35	58
	0.250 mm	26	45
	0.150 mm	20	38
	0.075 mm	16	33
Grading Modulus		1.64	1.20

Hydrometer Analysis **SANS 3001 GR3**

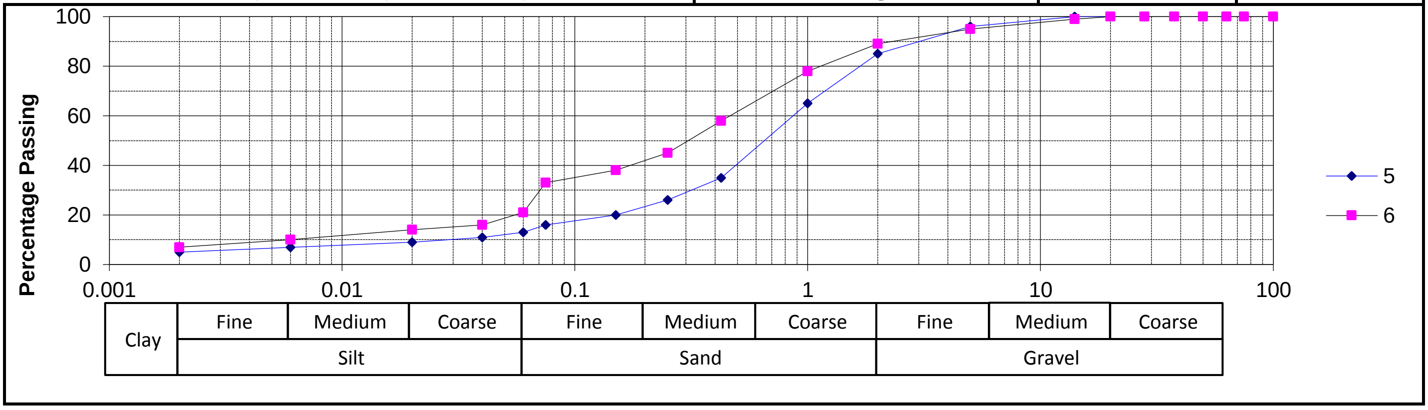
Percentage Passing	0.060 mm	13	21
	0.040 mm	11	16
	0.020 mm	9	14
	0.006 mm	7	10
	0.002 mm	5	7
Gravel	%	15	11
Sand	%	72	68
Silt	%	8	14
Clay	%	5	7

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





Laboratory Number		5 ◆	6 ■
Atterberg Limits -425µ		**SANS 3001 GR10**	
Liquid Limit	%	29	22
Plasticity Index	%	13	10
Linear Shrinkage	%	5.5	5.0
Overall PI	%	5	6
Classifications			
HRB (AASHTO)		A-2-6(0)	A-2-4(0)
Unified (ASTM D2487)		SC	SC
Weston Swell @ 1 kPa			



Client	:	NKANIVO DEVELOPMENT CONSULTANTS (COO	Date Received:	17/11/2020
Project	:	Dawrsloop 248KU	Date Reported:	02/12/2020
Project No	:	2020-B-1504	Page No. :	7 of 14

FOUNDATION INDICATOR

Laboratory Number		7 ◆	8 ■
Field Number		TP9	TP11
Client Reference			
Depth (m)		0.40-1.40	0.40-
Position			
Coordinates	X		
	Y		
Description			
Aditional Information			
Calcrete / Crushed			
Stabilizing Agent			

Moisture Content & Relative Density

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

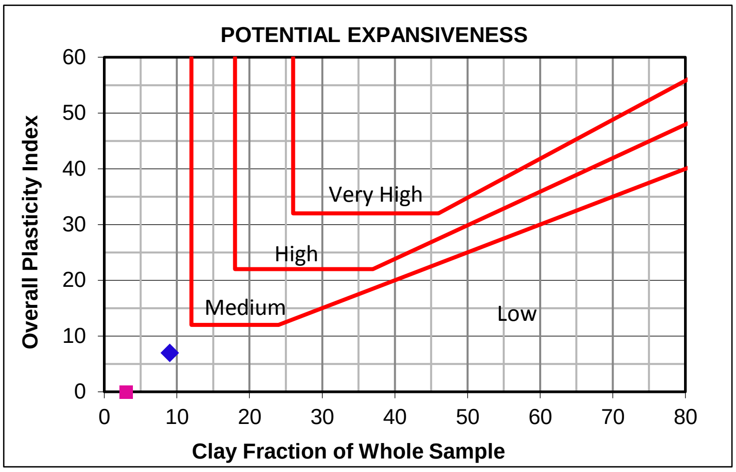
Sieve Analysis (Wet Prep) **SANS 3001 GR1**

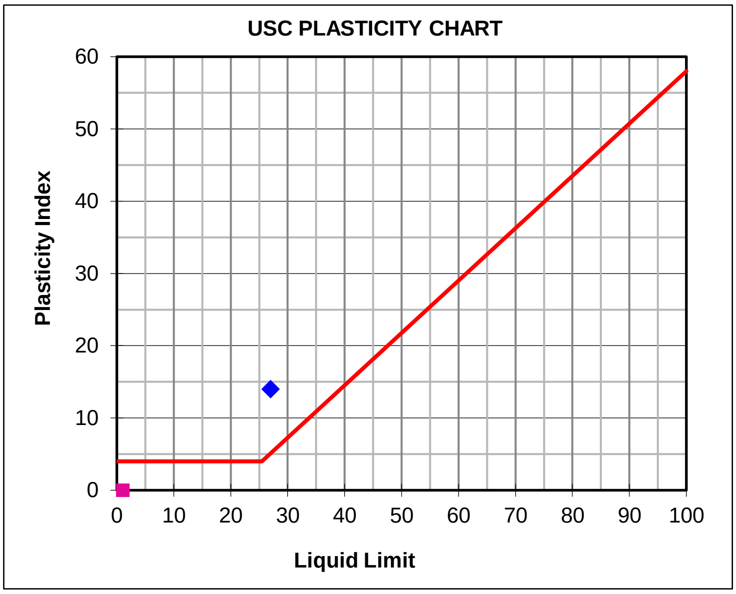
Percentage Passing	100 mm	100	100
	75 mm	100	100
	63 mm	100	100
	50 mm	100	100
	37.5 mm	100	100
	28 mm	100	100
	20 mm	100	100
	14 mm	100	100
	5 mm	100	97
	2 mm	99	89
	1 mm	84	66
	0.425 mm	49	44
	0.250 mm	36	35
	0.150 mm	30	27
	0.075 mm	26	21
Grading Modulus		1.26	1.46

Hydrometer Analysis **SANS 3001 GR3**

Percentage Passing	0.060 mm	17	10
	0.040 mm	15	8
	0.020 mm	12	7
	0.006 mm	10	4
	0.002 mm	9	3
Gravel	%	1	11
Sand	%	82	79
Silt	%	8	7
Clay	%	9	3

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





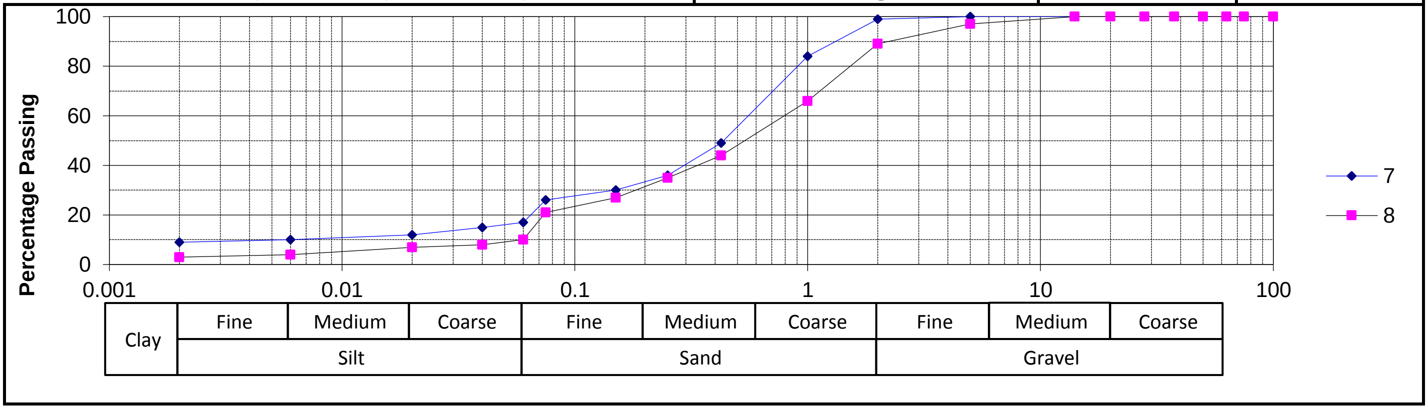
Laboratory Number		7 ◆	8 ■

Atterberg Limits -425µ **SANS 3001 GR10**

Liquid Limit	%	27	
Plasticity Index	%	14	NP
Linear Shrinkage	%	6.0	
Overall PI	%	7	

Classifications

HRB (AASHTO)	A-2-6(0)	A-1-b(0)
Unified (ASTM D2487)	SC	SM
Weston Swell @ 1 kPa		



Client	:	NKANIVO DEVELOPMENT CONSULTANTS (COO	Date Received:	17/11/2020
Project	:	Dawrsloop 248KU	Date Reported:	02/12/2020
Project No	:	2020-B-1504	Page No. :	8 of 14

FOUNDATION INDICATOR

Laboratory Number		9 ◆	10 ■
Field Number		TP12	TP15
Client Reference			
Depth (m)		0.50-2.20	0.40-1.20
Position			
Coordinates	X		
	Y		
Description			
Aditional Information			
Calcrete / Crushed			
Stabilizing Agent			

Moisture Content & Relative Density

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

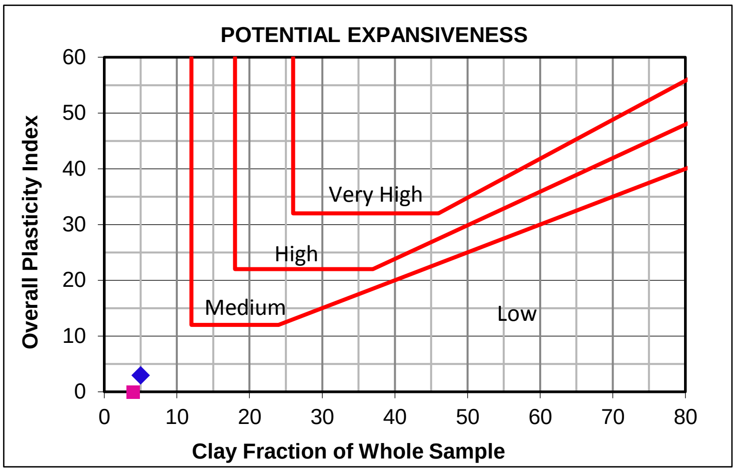
Sieve Analysis (Wet Prep) **SANS 3001 GR1**

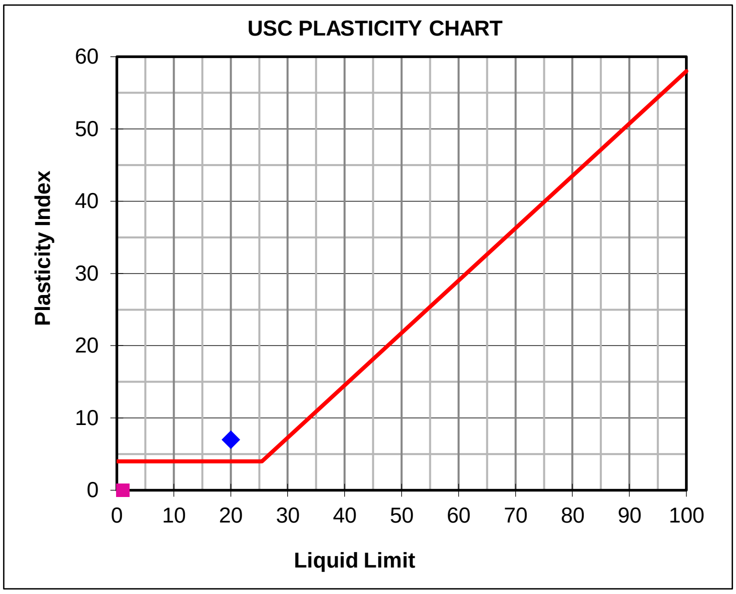
Percentage Passing	100 mm	100	100
	75 mm	100	100
	63 mm	100	100
	50 mm	100	100
	37.5 mm	100	100
	28 mm	100	100
	20 mm	100	100
	14 mm	100	98
	5 mm	99	95
	2 mm	85	89
	1 mm	57	64
	0.425 mm	38	41
	0.250 mm	31	31
	0.150 mm	27	25
	0.075 mm	23	21
Grading Modulus		1.54	1.49

Hydrometer Analysis **SANS 3001 GR3**

Percentage Passing	0.060 mm	15	10
	0.040 mm	13	8
	0.020 mm	10	7
	0.006 mm	6	4
	0.002 mm	5	4
Gravel	%	15	11
Sand	%	70	79
Silt	%	10	6
Clay	%	5	4

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





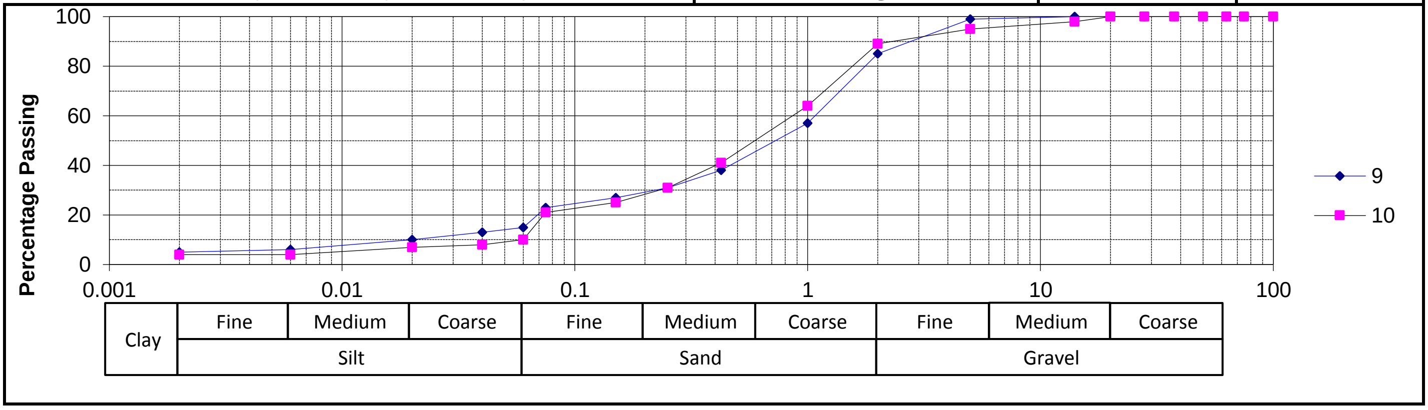
Laboratory Number	9 ◆	10 ■

Atterberg Limits -425µ **SANS 3001 GR10**

Liquid Limit	%	20	
Plasticity Index	%	7	NP
Linear Shrinkage	%	3.0	
Overall PI	%	3	

Classifications

HRB (AASHTO)	A-2-4(0)	A-1-b(0)
Unified (ASTM D2487)	SC-SM	SM
Weston Swell @ 1 kPa		



Client	:	NKANIVO DEVELOPMENT CONSULTANTS (COO	Date Received:	17/11/2020
Project	:	Dawrsloop 248KU	Date Reported:	02/12/2020
Project No	:	2020-B-1504	Page No. :	9 of 14

FOUNDATION INDICATOR

Laboratory Number		11 ◆	■
Field Number		TP16	
Client Reference			
Depth (m)		0.35-1.40	
Position			
Coordinates	X		
	Y		
Description			
Aditional Information			
Calcrete / Crushed			
Stabilizing Agent			

Moisture Content & Relative Density

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

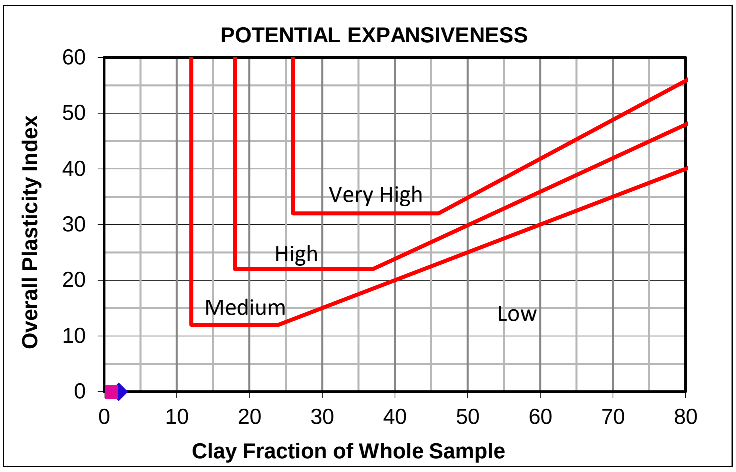
Sieve Analysis (Wet Prep) **SANS 3001 GR1**

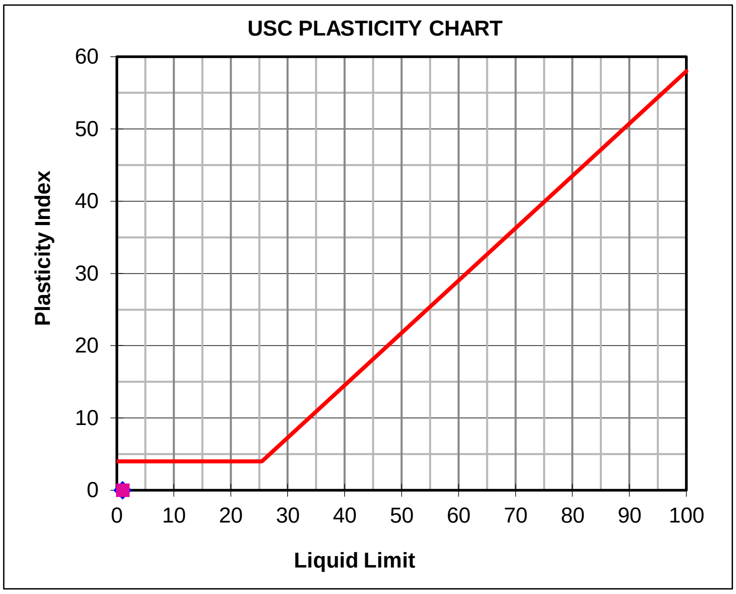
Percentage Passing	100 mm	100	
	75 mm	100	
	63 mm	100	
	50 mm	100	
	37.5 mm	100	
	28 mm	100	
	20 mm	100	
	14 mm	98	
	5 mm	84	
	2 mm	67	
	1 mm	49	
	0.425 mm	32	
	0.250 mm	27	
	0.150 mm	23	
	0.075 mm	20	
Grading Modulus		1.81	

Hydrometer Analysis **SANS 3001 GR3**

Percentage Passing	0.060 mm	10	
	0.040 mm	8	
	0.020 mm	6	
	0.006 mm	3	
	0.002 mm	2	
Gravel	%	33	
Sand	%	57	
Silt	%	8	
Clay	%	2	

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

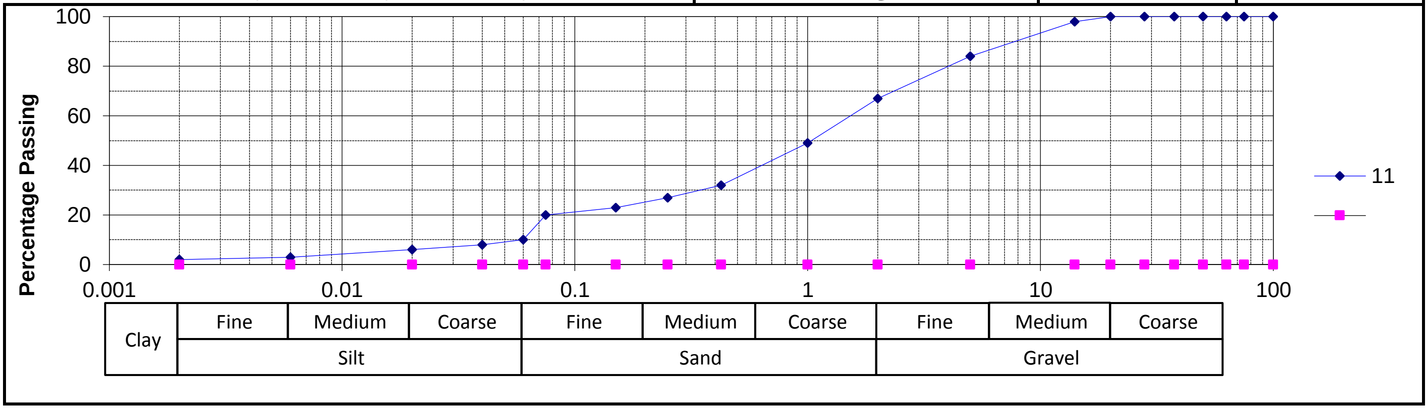




Laboratory Number		11 ◆	■
Atterberg Limits -425µ		**SANS 3001 GR10**	
Liquid Limit	%		
Plasticity Index	%	NP	
Linear Shrinkage	%		
Overall PI	%		

Classifications

HRB (AASHTO)	A-1-b(0)	
Unified (ASTM D2487)	SM	
Weston Swell @ 1 kPa		



Client	:	NKANIVO DEVELOPMENT CONSULTANTS (COO	Date Received:	17/11/2020
Project	:	Dawrsloop 248KU	Date Reported:	02/12/2020
Project No:		2020-B-1504	Page No. :	10 of 14

MOISTURE DENSITY RELATIONSHIP

Laboratory Number		2
Field Number		TP2
Client Reference		
Depth (m)		0.50-1.80
Position		
Coordinates	X	
	Y	
Description		
Additional Information		
Calcrete / Crushed		
Stabilizing Agent		

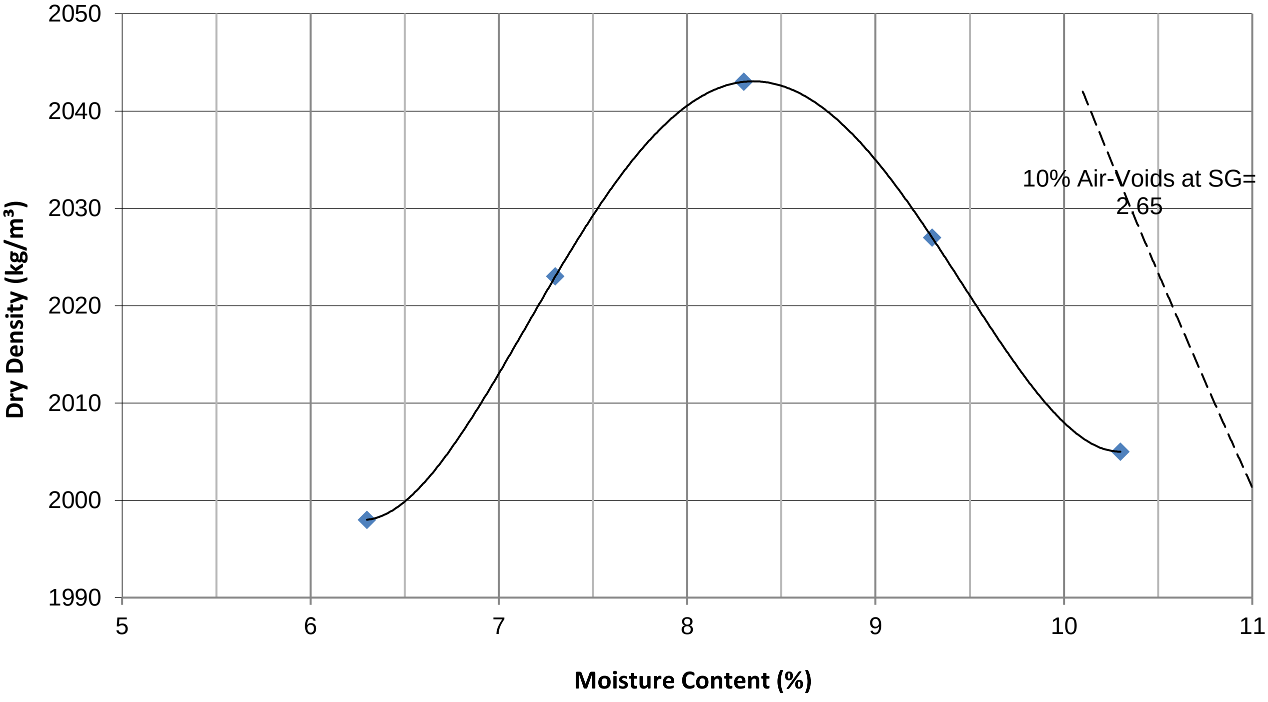
Maximum Dry Density & Optimum Moisture Content - SANS 3001 GR30

Compactive Effort:	Modified AASHTO

Dry Density	kg/m³	1998	2023	2043	2027	2005	
Moisture Content	%	6.3	7.3	8.3	9.3	10.3	

Max. Dry Density	kg/m³	2043
Optimum Moisture	%	8.4

NB! Air-Void curves might be based on assumend Specific Gravity values.



Client :	NKANIVO DEVELOPMENT CONSULTANTS (COO	Date Received:	17/11/2020
Project :	Dawrsloop 248KU	Date Reported:	02/12/2020
Project No:	2020-B-1504	Page No. :	11 of 14

MOISTURE DENSITY RELATIONSHIP

Laboratory Number		6
Field Number		TP7
Client Reference		
Depth (m)		0.55-1.20
Position		
Coordinates	X	
	Y	
Description		
Additional Information		
Calcrete / Crushed		
Stabilizing Agent		

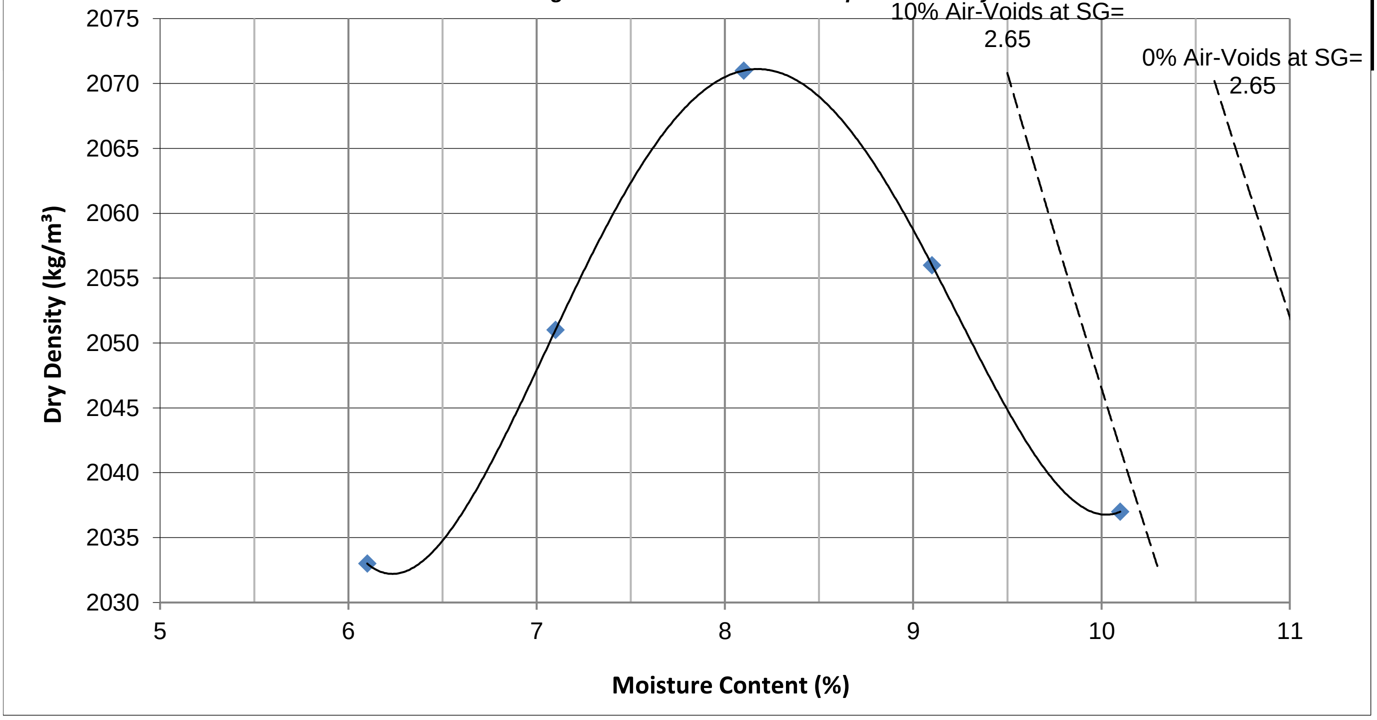
Maximum Dry Density & Optimum Moisture Content - SANS 3001 GR30

Compactive Effort:	Modified AASHTO

Dry Density	kg/m³	2033	2051	2071	2056	2037	
Moisture Content	%	6.1	7.1	8.1	9.1	10.1	

Max. Dry Density	kg/m³	2071
Optimum Moisture	%	8.2

NB! Air-Void curves might be based on assumend Specific Gravity values.



Client :	NKANIVO DEVELOPMENT CONSULTANTS (COO	Date Received:	17/11/2020
Project :	Dawrsloop 248KU	Date Reported:	02/12/2020
Project No:	2020-B-1504	Page No. :	12 of 14

MOISTURE DENSITY RELATIONSHIP

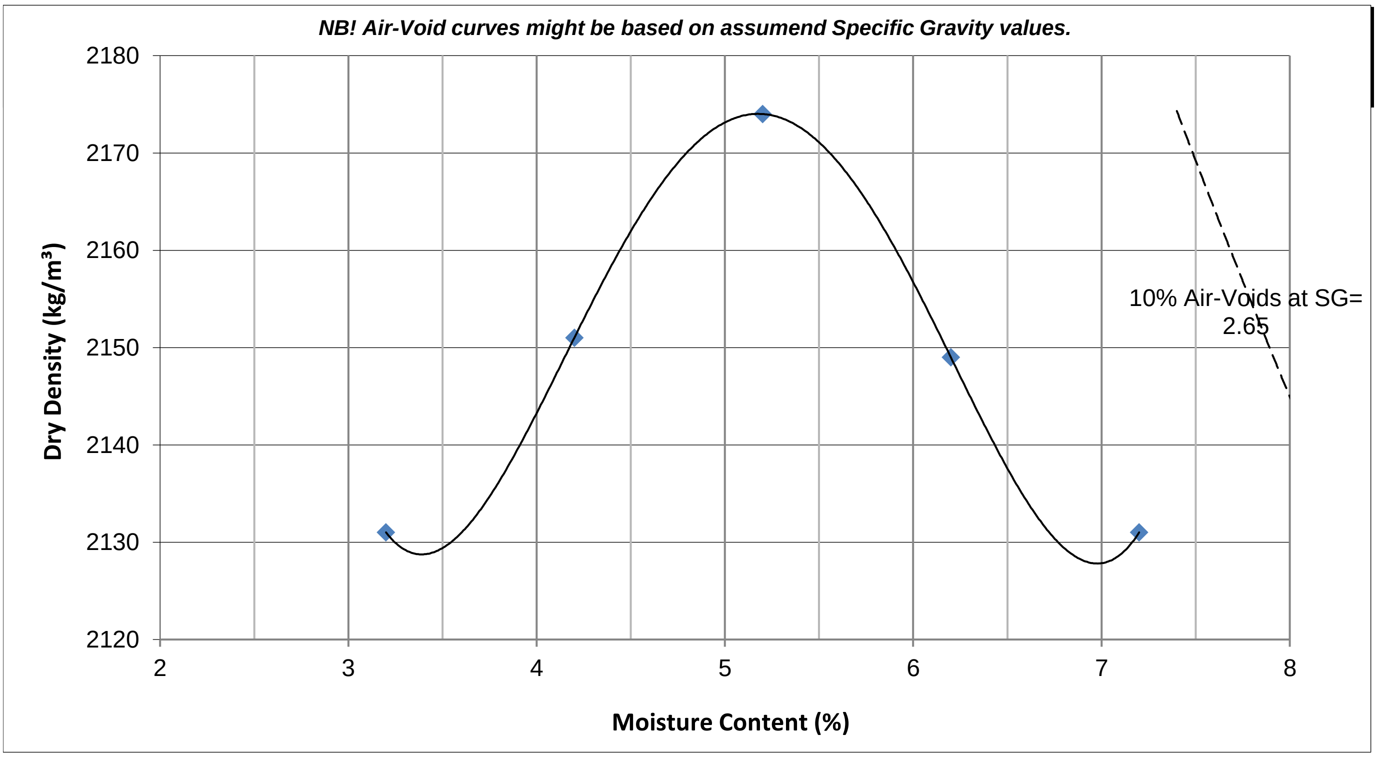
Laboratory Number		10
Field Number		TP15
Client Reference		
Depth (m)		0.40-1.20
Position		
Coordinates	X	
	Y	
Description		
Additional Information		
Calcrete / Crushed		
Stabilizing Agent		

Maximum Dry Density & Optimum Moisture Content - SANS 3001 GR30

Compactive Effort:	Modified AASHTO

Dry Density	kg/m³	2131	2151	2174	2149	2131	
Moisture Content	%	3.2	4.2	5.2	6.2	7.2	

Max. Dry Density	kg/m³	2174
Optimum Moisture	%	5.2



Client : NKANIVO DEVELOPMENT CONSULTANTS (COO
Project : Dawrsloop 248KU
Project No. : 2020-B-1504
Date Received : 17/11/2020
Date Reported : 02/12/2020
Page No. : 13 of 14

CALIFORNIA BEARING RATIO (CBR) & ROAD INDICATOR REPORT

Laboratory No.		2 ◆	6 ■
Field Number		TP2	TP7
Client Reference			
Depth (m)		0.50-1.80	0.55-1.20
Position			
Coordinates	X		
	Y		
Description			
Additional information			
Calcrete/Crushed			
Stabilizing Agent			

Sieve Analysis (Wet preparation) **SANS 3001 GR1**

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	97	99
	5 mm	89	95
	2 mm	72	89
	1 mm	52	78
	0.425 mm	35	58
	0.250 mm	28	45
	0.150 mm	23	38
	0.075 mm	19	33
Grading Modulus		1.7	1.2

Soil Mortar Analysis

Coarse Sand	51	35
Coarse Fine Sand	9	14
Medium Fine Sand	7	8
Fine Fine Sand	6	6
Silt and Clay	27	37

Atterberg Limits SANS 3001 GR10

Liquid Limit (%)	28	22
Plasticity Index (%)	12	10
Linear Shrinkage (%)	4.5	5.0

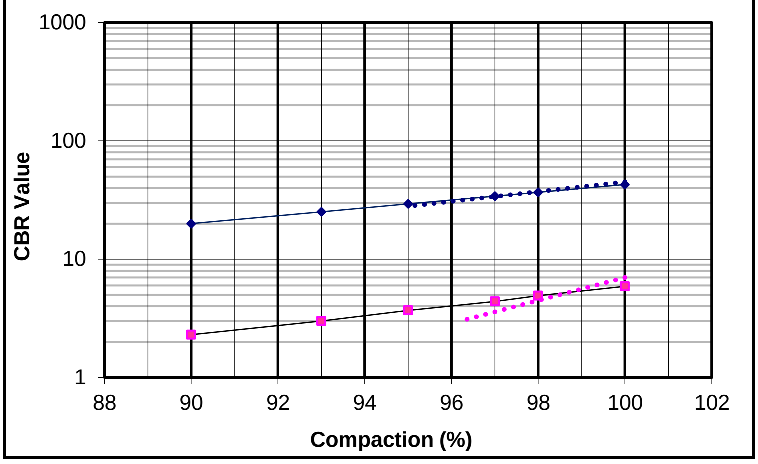
Laboratory No.		2 ◆	6 ■

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

MDD	kg/m^3	2043	2071
OMC	%	8.4	8.2

California Bearing Ratio **SANS 3001 GR40**

Compaction Data							
Moisture	%	8.3			8.1		
Dry Density	kg/m^3	2050	1948	1845	2073	1995	1880
Compaction	%	100.0	95.0	90.0	100.0	96.2	90.7
Penetration Data							
CBR at	2.50 mm	45	28	20	7	3	2
	5.00 mm	66	33	25	11	4	2
	7.50 mm	78	34	27	13	4	2
Swell	%	0.1	0.3	0.5	1.1	1.3	1.2
Final Moisture (%)		9.6	11.7	17.3	12.8	14.1	15.6

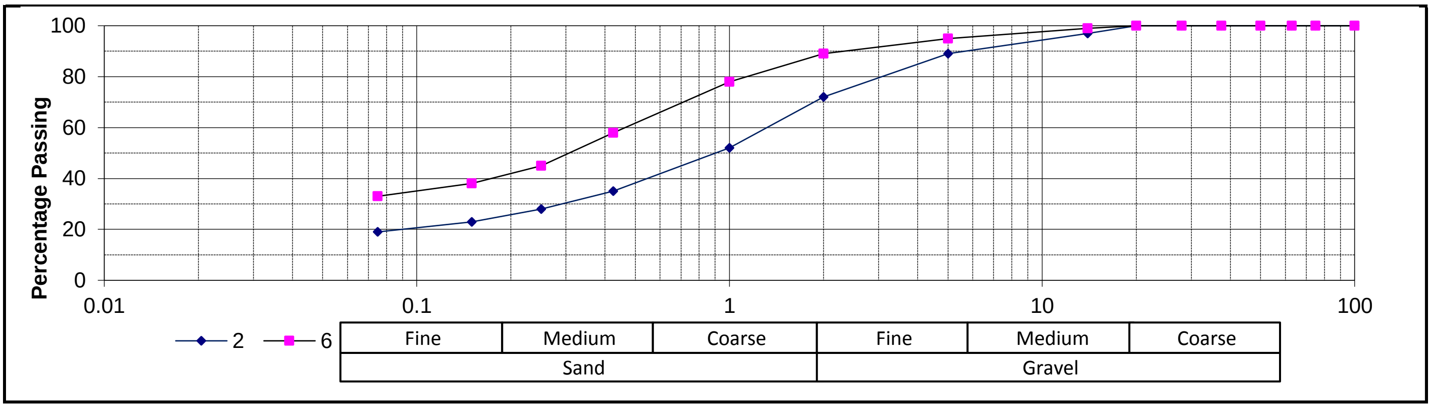


Interpolated CBR Data

CBR	@ 100% Mod. AASHTO	43	6
	@ 98% Mod. AASHTO	37	5
	@ 97% Mod. AASHTO	34	4
	@ 95% Mod. AASHTO	29	4
	@ 93% Mod. AASHTO	25	3
	@ 90% Mod. AASHTO	20	2
	@ SANS3001 Midpoint	35	5

Classifications

HRB (AASHTO)	A-2-6(0)	A-2-4(0)
COLTO	G6	
TRH14	G6	



36 Fourth Street, Booysens Reserve, Johannesburg 2091
PO Box 82223, Southdale 2135
Tel: +27 (0)11 835 3117•Fax: +27 (0)11 835 2503
E-mail: jhb@civilab.co.za•Website: www.civilab.co.za

sanas Testing Laboratory T0062

Civilab
Civil Engineering Testing Laboratories

Client	:	NKANIVO DEVELOPMENT CONSULTANTS (COO	Date Received	:	17/11/2020
Project	:	Dawrsloop 248KU	Date Reported	:	02/12/2020
Project No.	:	2020-B-1504	Page No.	:	14 of 14

CALIFORNIA BEARING RATIO (CBR) & ROAD INDICATOR REPORT

Laboratory No.		10 ◆	■
Field Number		TP15	
Client Reference			
Depth (m)		0.40-1.20	
Position			
Coordinates	X		
	Y		
Description			
Additional information			
Calcrete/Crushed			
Stabilizing Agent			

Sieve Analysis (Wet preparation) **SANS 3001 GR1**

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	98	
	5 mm	95	
	2 mm	89	
	1 mm	64	
	0.425 mm	41	
	0.250 mm	31	
	0.150 mm	25	
	0.075 mm	21	
Grading Modulus		1.5	

Soil Mortar Analysis

Coarse Sand	54	
Coarse Fine Sand	11	
Medium Fine Sand	6	
Fine Fine Sand	5	
Silt and Clay	23	

Atterberg Limits SANS 3001 GR10

Liquid Limit (%)		
Plasticity Index (%)	NP	
Linear Shrinkage (%)		

Laboratory No.		10 ◆			■			

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

MDD	kg/m^3	2174	
OMC	%	5.2	

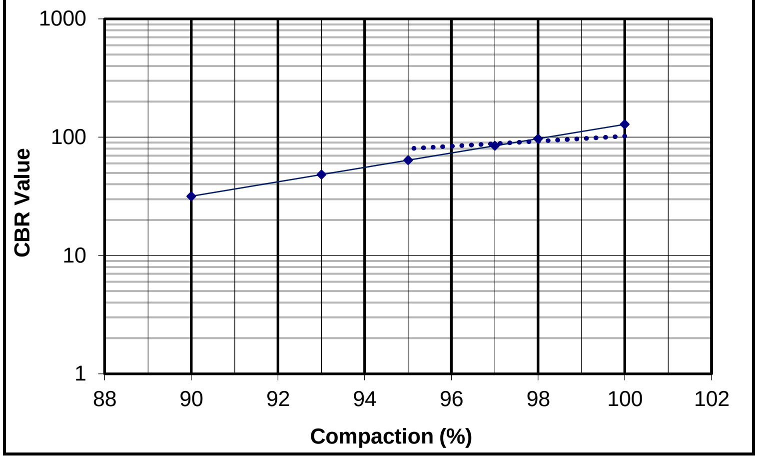
California Bearing Ratio **SANS 3001 GR40**

Compaction Data

Moisture	%	5.2					
Dry Density	kg/m^3	2203	2092	1985			
Compaction	%	100.0	95.0	90.1			

Penetration Data

CBR at	2.50 mm	102	80	32			
	5.00 mm	144	82	50			
	7.50 mm	121	67	51			
Swell	%	0.1	-15.6	0.2			
Final Moisture (%)		7.0	9.8	15.4			

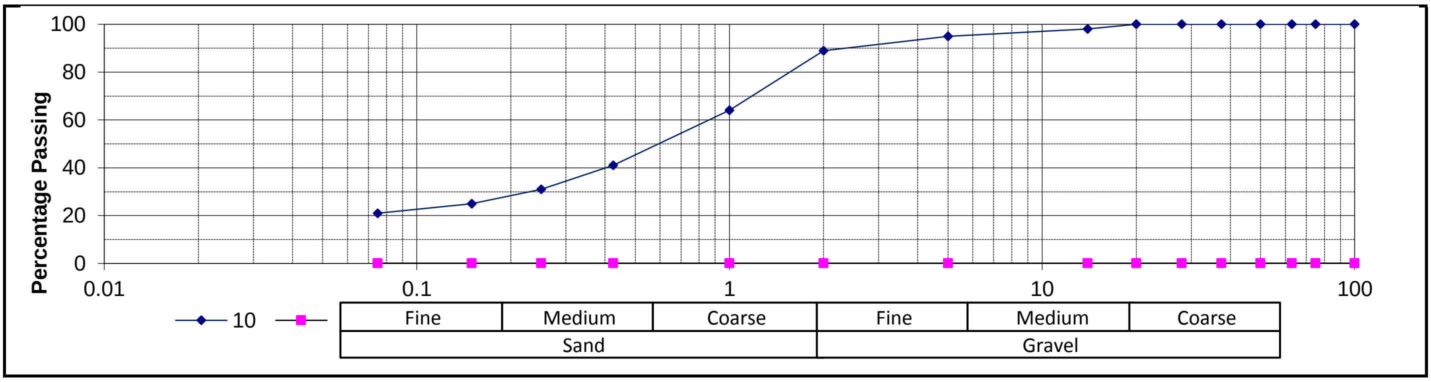


Interpolated CBR Data

CBR	@ 100%	Mod. AASHTO	128	
	@ 98%		97	
	@ 97%		84	
	@ 95%		64	
	@ 93%		48	
	@ 90%		32	
	@ SANS3001 Midpoint		91	

Classifications

HRB (AASHTO)	A-1-b(0)	
COLTO	G6	
TRH14	G6	

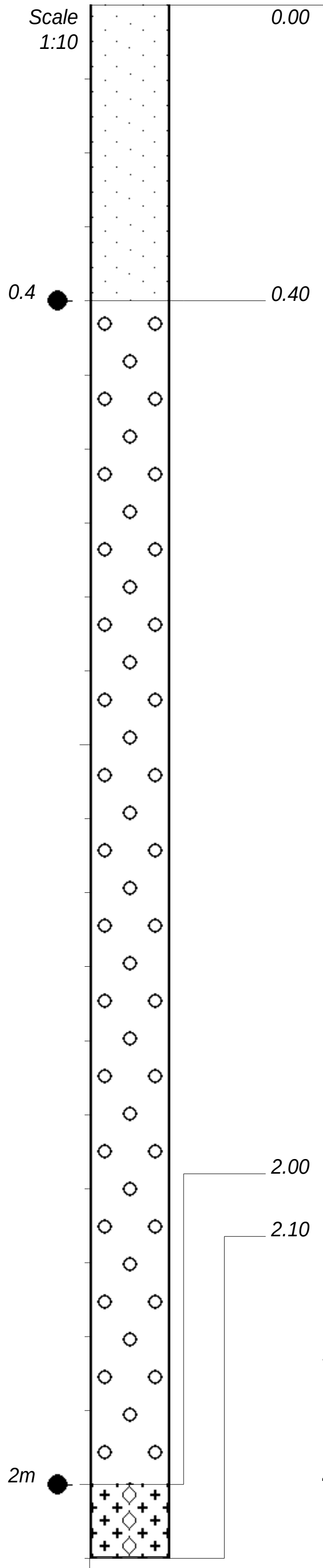


APPENDIX C: TEST PIT SOIL PROFILES

Nkanivo Development Consultant
Phase 1 Near surface geotechnical investigation

HOLE No: TP 01
Sheet 1 of 1

JOB NUMBER: 000



0.00 Dry to Slightly moist, greyish, intact, Dense, Sandy Silt. **TOPSOIL.**

0.40 Slightly moist, dark brown,intact, Dense, Gravelly sand. **RESIDUAL SOIL.**

2.00 Weathered hardrock granite. **BEDROCK.**

2.10

NOTES

1) Roots inclusion from a depth of 0.0 - 0.5m
2) Stable side walls
3) No water seepage encountered
4) Refusal encountered at 2.1m
5) Disturbed sample taken at 0.4 - 2m
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 : 12/11/2020

DATE : 06/12/2020 11:21
TEXT : ..00\Examples\Examples.TXT

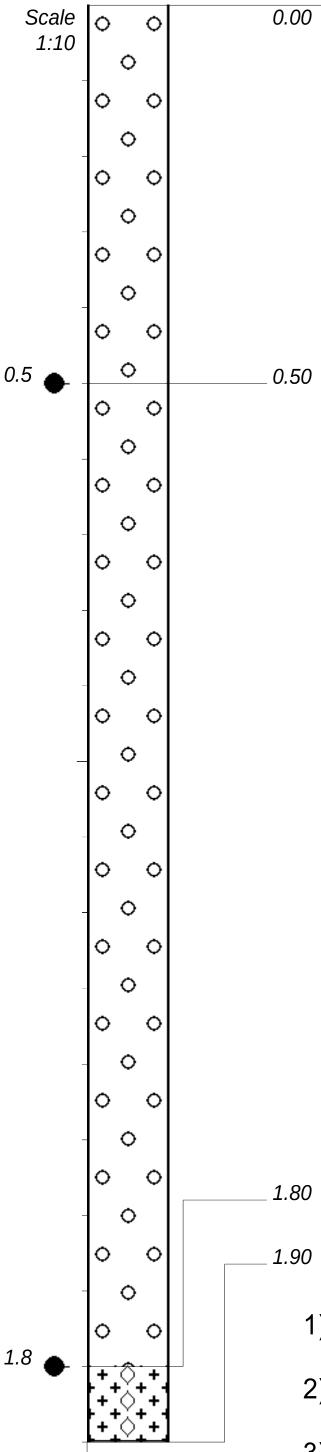
ELEVATION : 551m
X-COORD : 31°5’13.57"E
Y-COORD : 24°46’48.79"S

HOLE No: TP 01

Nkanivo Development Consultant
Phase 1 Near surface geotechnical investigation

HOLE No: TP 02
Sheet 1 of 1

JOB NUMBER: 000



0.00

Slightly moist, light brown, intact, <u>Dense</u>, Gravelly sand. **TOPSOIL.**

0.50

Moist, dar1k brown,intact, <u>Dense</u>, Gravelly sand. **RESIDUAL SOIL.**

1.80

Refusal at hardrock granite. **BEDROCK.**

1.90

NOTES

1) Roots inclusion from a depth of 0.0 - 0.45m
2) Stable side walls
3) No water seepage encountered
4) No refusal encountered at 1.9 m
5) Disturbed sample taken at 0.5 - 1.8 m
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 : 12/11/2020

DATE : 06/12/2020 11:21
TEXT : ..00\Examples\Examples.TXT

ELEVATION : 550m
X-COORD : 31°5’23.62"E
Y-COORD : 24°46’49.03"S

HOLE No: TP 02

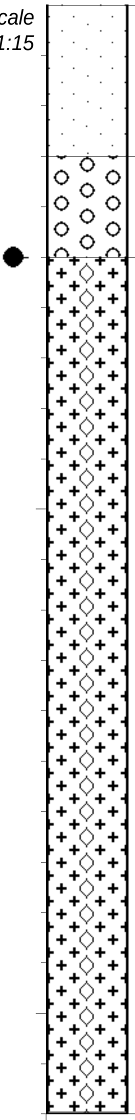
Nkanivo Development Consultant
Phase 1 Near surface geotechnical investigation

HOLE No: TP 03
Sheet 1 of 1

JOB NUMBER: 000

Scale
1:15

0.5-2.2m



0.00	Dry to Slightly moist, greyish, intact, Dense, Sandy clay. **TOPSOIL.**
0.30	Slightly moist, yellowish, intact, Dense, gravel. **RESIDUAL SOIL.**
0.50	Weathered hardrock granite. **BEDROCK.**
2.20	

NOTES

1) Roots inclusion from a depth of 0.0 - 0.5m
2) Stable side walls
3) No water seepage encountered
4) Refusal encountered at 2.2 m
5) Disturbed sample taken at 0.5-2.2m
6) No Unditurbed sample taken

CONTRACTOR :
MACHINE : Tractor Loader Backhoe (TLB).
DRILLED BY :
PROFILED BY : Mavhetha Lavhelesani

INCLINATION :
DIAM : 0.7 m
DATE :
DATE : 12/11/2020

ELEVATION : 547m
X-COORD : 31°5’29.85"E
Y-COORD : 24°46’46.45"S

HOLE No: TP 03

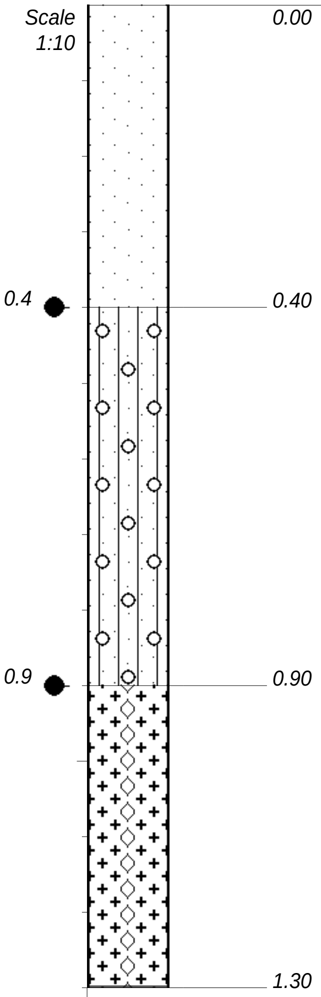
TYPE SET BY : Mavhetha Lavhelesani
SETUP FILE : STANDARD.SET

DATE : 06/12/2020 11:21
TEXT : ..00\Examples\Examples.TXT

Nkanivo Development Consultant
Phase 1 Near surface geotechnical investigation

HOLE No: TP 04
Sheet 1 of 1

JOB NUMBER: 000



Dry to Slightly moist, greyish, intact, <u>Loose</u>, Sandy Silt. **TOPSOIL.**

Slightly moist, greyish mottled light brown, <u>medium</u> dense, intact, Gravelly sandy silt. **RESIDUAL SOIL.**

Weathered hardrock granite. **BEDROCK.**

NOTES

1) Roots inclusion from a depth of 0 - 0.6m
2) Stable side walls
3) No water seepage encountered
4) Refusal encountered at 1.3 m
5) Disturbed sample taken at 0.4 - 0.9 m
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 : 12/11/2020

DATE : 06/12/2020 11:21
TEXT : ..00\Examples\Examples.TXT

ELEVATION : 554m
X-COORD : 31°5’31.28"E
Y-COORD : 24°46’42.65"S

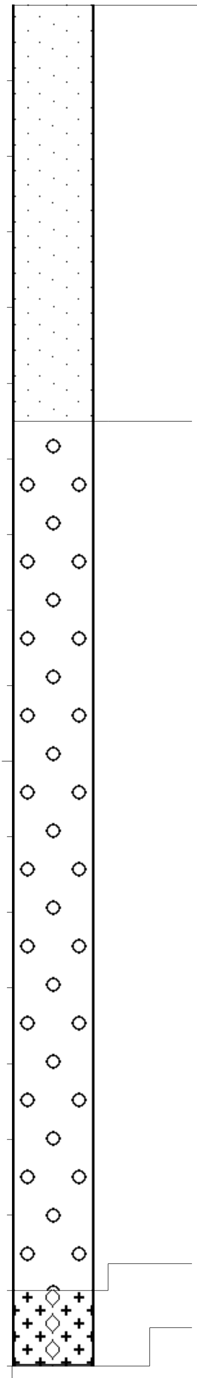
HOLE No: TP 04

Nkanivo Development Consultant
Phase 1 Near surface geotechnical investigation

HOLE No: TP 05
Sheet 1 of 1

JOB NUMBER: 000

Scale 1:10



0.00 Dry to Slightly moist, greyish, intact, <u>Dense</u>, Sandy Silt. **TOPSOIL.**

0.55 Slightly moist, dark brown,intact, <u>Dense</u>, Gravelly sand. **RESIDUAL SOIL.**

1.70 Refusal at hard rock granite. **BEDROCK.**

1.80

NOTES

1) Stable side walls
2) No water seepage encountered
3) No refusal encountered at 1.8 m
4) No Disturbed sample taken
5) No Unditurbed sample taken

CONTRACTOR :
MACHINE : Tractor Loader Backhoe (TLB).
DRILLED BY :
PROFILED BY : Mavhetha Lavhelesani

INCLINATION :
DIAM : 0.7 m
DATE :
DATE : 12/11/2020

ELEVATION : 559m
X-COORD : 31°5’24.52"E
Y-COORD : 24°46’42.47"S

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

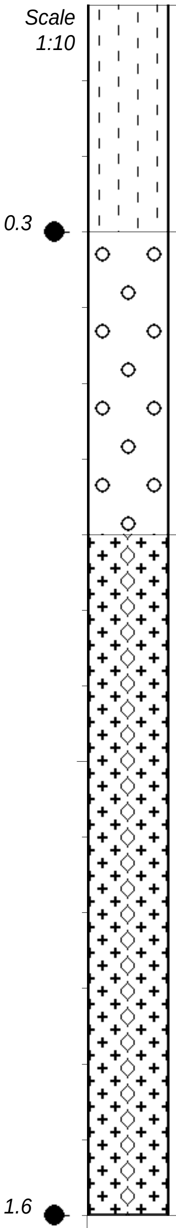
DATE : 06/12/2020 11:21
TEXT : ..00\Examples\Examples.TXT

HOLE No: TP 05

Nkanivo Development Consultant
Phase 1 Near surface geotechnical investigation

HOLE No: TP 06
Sheet 1 of 1

JOB NUMBER: 000



0.00	Slightly moist, brownish, <u>Medium</u> dense, intact, Silty sand. **TOPSOIL.**
0.30	Slightly Moist, light brown, <u>Medium</u> dense to dense, Gravelly sand. **Residual soil.**
0.70	Weathered hardrock granite. **BEDROCK.**
1.60	

NOTES

1) Roots inclusion from a depth of 0 - 0.56m
2) Stable side walls
3) No water seepage encountered
4) Refusal encountered at 1.6 m
5) No disturbed sample taken 0.3 - 1.6 m
6) No Unditurbed sample taken

CONTRACTOR :
MACHINE : Tractor Loader Backhoe (TLB).
DRILLED BY :
PROFILED BY : Mavhetha Lavhelesani

INCLINATION :
DIAM : 0.7 m
DATE :
DATE : 12/11/2020

ELEVATION : 559m
X-COORD : 31°5’16.21"E
Y-COORD : 24°46’44.47"S

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

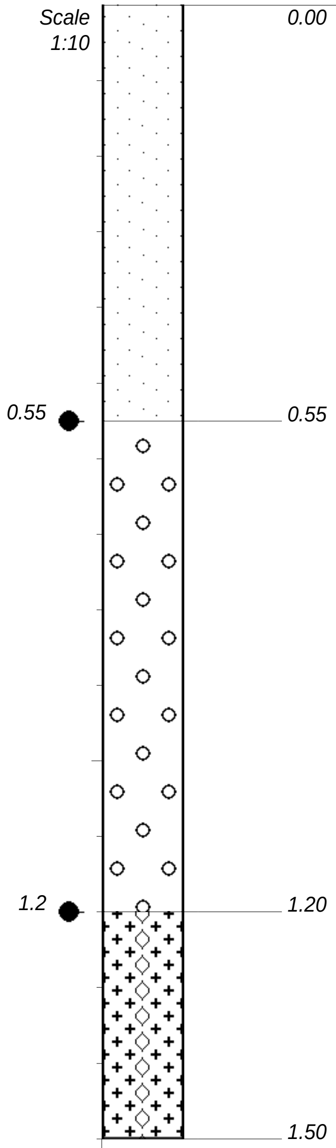
DATE : 06/12/2020 11:21
TEXT : ..00\Examples\Examples.TXT

HOLE No: TP 06

Nkanivo Development Consultant
Phase 1 Near surface geotechnical investigation

HOLE No: TP 07
Sheet 1 of 1

JOB NUMBER: 000



Slightly moist to moist, whitish, intact, Medium dense, Sandy Silt. **TOPSOIL.**

Moist, Whitish mottled yellow,intact, Medium dense, Gravelly sand. **Residual SOIL.**

Weathered hardrock granite. **BEDROCK.**

NOTES

1) Roots inclusion from a depth of 0 - 0.8m
2) Stable side walls
3) No water seepage encountered
4) Refusal encountered at 1.5 m
5) Disturbed sample taken 0.55 - 1.2 m
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 : 12/11/2020
DATE : 06/12/2020 11:21
TEXT : ..00\Examples\Examples.TXT

ELEVATION : 564m
X-COORD : 31°5’10.66"E
Y-COORD : 24°46’42.02"S

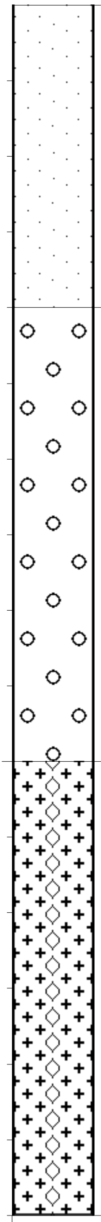
HOLE No: TP 07

Nkanivo Development Consultant
Phase 1 Near surface geotechnical investigation

HOLE No: TP 08
Sheet 1 of 1

JOB NUMBER: 000

Scale
1:10



0.00	Slightly moist to moist, whitish, intact, Medium dense, Sandy Silt. **TOPSOIL.**
0.40	Moist, Whitish mottled yellow,intact, Medium dense, Gravelly sand. **Residual SOIL.**
1.00	Weathered yellowish hardrock granite. **BEDROCK.**
1.60	

NOTES

1) Roots inclusion from a depth of 0 - 0.45m
2) Stable side walls
3) No water seepage encountered
4) Refusal encountered at 1.6 m
5) No disturbed sample taken
6) No Unditurbed sample taken

CONTRACTOR :
MACHINE : Tractor Loader Backhoe (TLB).
DRILLED BY :
PROFILED BY : Mavhetha Lavhelesani

INCLINATION :
DIAM : 0.7 m
DATE :
DATE : 12/11/2020

ELEVATION : 589m
X-COORD : 31°5'11.83"E
Y-COORD : 24°46'35.10"S

HOLE No: TP 08

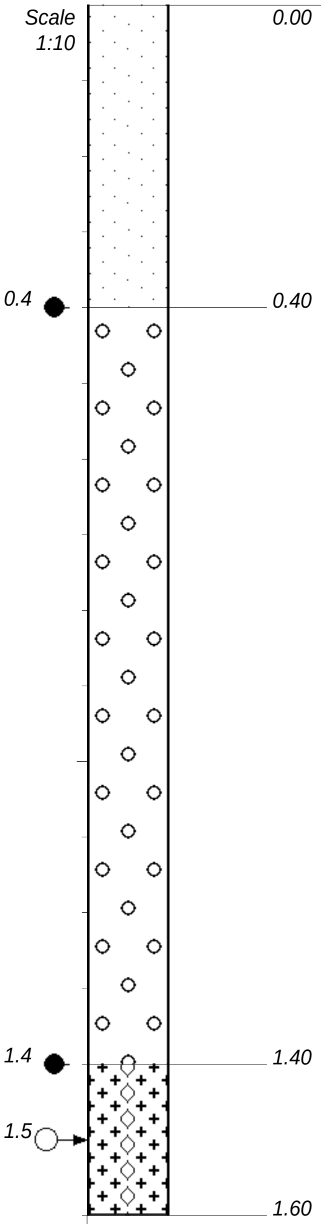
TYPE SET BY : Mavhetha Lavhelesani
SETUP FILE : STANDARD.SET

DATE : 06/12/2020 11:22
TEXT : ..00\Examples\Examples.TXT

Nkanivo Development Consultant
Phase 1 Near surface geotechnical investigation

HOLE No: TP 09
Sheet 1 of 1

JOB NUMBER: 000



Slightly moist to moist, whitish, intact, Medium dense, Sandy Silt. **TOPSOIL.**

Moist to very moist, Whitish mottled yellow,intact, Medium dense, Gravelly sand. **Residual SOIL.**

Refusal at hardrock granite. **BEDROCK.**

NOTES

1) Roots inclusion from a depth of 0 - 0.5m
2) Stable side walls
3) Water seepage encountered at 1.5 m
4) Refusal encountered at 1.6 m
5) Disturbed sample taken 0.4 - 1.4 m
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 : 12/11/2020

DATE : 06/12/2020 11:22
TEXT : ..00\Examples\Examples.TXT

ELEVATION : 575m
X-COORD : 31°5’8.09"E
Y-COORD : 24°46’31.11"S

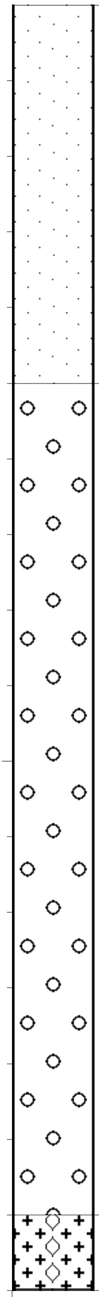
HOLE No: TP 09

Nkanivo Development Consultant
Phase 1 Near surface geotechnical investigation

HOLE No: TP 10
Sheet 1 of 1

JOB NUMBER: 000

Scale
1:10



0.00	Slightly moist to moist, whitish, intact, Medium dense, Sandy Silt. **TOPSOIL.**
0.50	Moist, Whitish mottled yellow,intact, Medium dense, Gravelly sand. **Residual SOIL.**
1.60	Refusal at hardrock granite. **BEDROCK.**
1.70	

NOTES

1) Stable side walls
2) No water seepage encountered
3) Refusal encountered at 1.7 m
4) No disturbed sample taken
5) 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 : 12/11/2020

DATE : 06/12/2020 11:22
TEXT : ..00\Examples\Examples.TXT

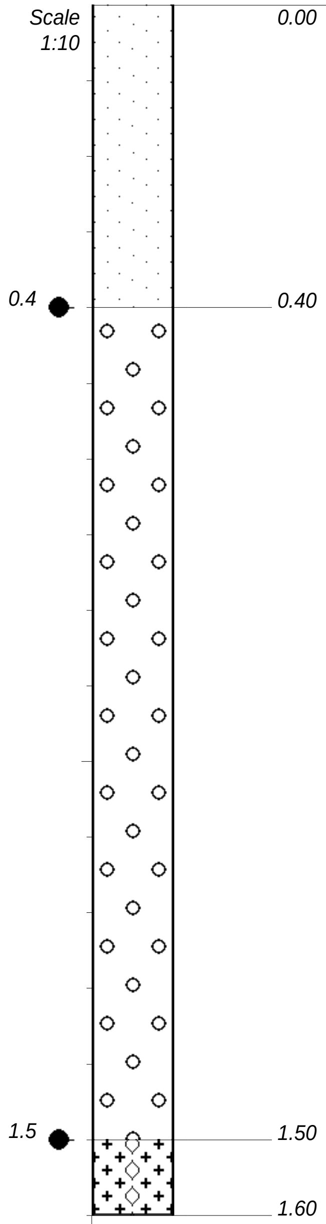
ELEVATION : 597m
X-COORD : 31°5’6.74"E
Y-COORD : 24°46’20.85"S

HOLE No: TP 10

Nkanivo Development Consultant
Phase 1 Near surface geotechnical investigation

HOLE No: TP 11
Sheet 1 of 1

JOB NUMBER: 000



Depth	Description
0.00 – 0.40	Slightly moist to moist, whitish, intact, Medium dense, Sandy Silt. **TOPSOIL.**
0.40 – 1.50	Moist, Whitish mottled yellow,intact, Medium dense, Gravelly sand. **Residual SOIL.**
1.50 – 1.60	Refusal at hardrock granite. **BEDROCK.**

NOTES

1) Stable side walls
2) No water seepage encountered
3) Refusal encountered at 1.6 m
4) Disturbed sample taken at 0.4 - 1.5 m
5) 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 : 12/11/2020
DATE : 06/12/2020 11:22
TEXT : ..00\Examples\Examples.TXT

ELEVATION : 558m
X-COORD : 31°5’14.94"E
Y-COORD : 24°46’20.81"S

HOLE No: TP 11

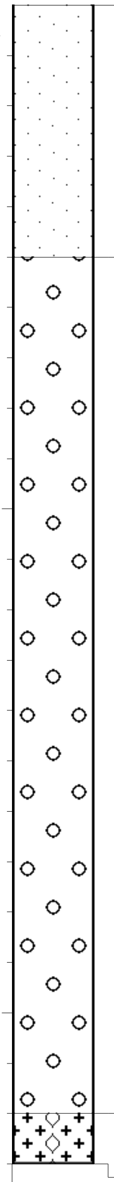
ZWANDAZWASHU CONSULTING

Nkanivo Development Consultant
Phase 1 Near surface geotechnical investigation

HOLE No: TP 12
Sheet 1 of 1

JOB NUMBER: 000

Scale
1:15



0.00

Slightly moist to moist, whitish, intact, Medium dense, Sandy Silt. **TOPSOIL.**

0.50

Moist, Whitish mottled yellow,intact, Medium dense, Gravelly sand. **Residual SOIL.**

2.20

Refusal at hardrock granite. **BEDROCK.**

2.30

NOTES

1) Stable side walls
2) No water seepage encountered
3) Refusal encountered at 2.3 m
4) No disturbed sample taken
5) No Undíturbed sample taken

CONTRACTOR :
MACHINE : Tractor Loader Backhoe (TLB).
DRILLED BY :
PROFILED BY : Mavhetha Lavhelesani

INCLINATION :
DIAM : 0.7 m
DATE :
DATE : 12/11/2020

ELEVATION : 567m
X-COORD : 31°5’21.73"E
Y-COORD : 24°46’18.25"S

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

DATE : 06/12/2020 11:22
TEXT : ..00\Examples\Examples.TXT

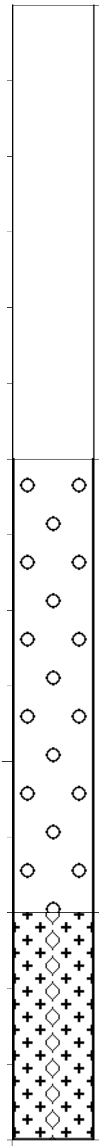
HOLE No: TP 12

Nkanivo Development Consultant
Phase 1 Near surface geotechnical investigation

HOLE No: TP 13
Sheet 1 of 1

JOB NUMBER: 000

Scale
1:10



0.00

Slightly moist, light brown, intact, Medium dense, Coarse Sand. **TOPSOIL.**

0.60

Moist, light brown,intact, Medium dense, Gravelly sand. **Residual SOIL.**

1.20

Weathered yellowish hardrock granite. **BEDROCK.**

1.50

NOTES

1) Roots inclusion from a depth of 0 - 0.9m
2) Stable side walls
3) No water seepage encountered
4) Refusal encountered at 1.5 m
5) No disturbed sample taken
6) No Unditurbed sample taken

CONTRACTOR :
MACHINE : Tractor Loader Backhoe (TLB).
DRILLED BY :
PROFILED BY : Mavhetha Lavhelesani

INCLINATION :
DIAM : 0.7 m
DATE :
DATE : 12/11/2020

ELEVATION : 577m
X-COORD : 31°5’24"E
Y-COORD : 24°46’30.1"S

HOLE No: TP 13

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

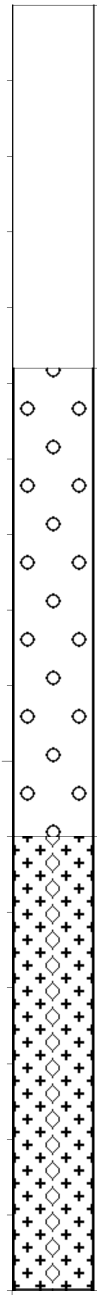
DATE : 06/12/2020 11:22
TEXT : ..00\Examples\Examples.TXT

Nkanivo Development Consultant
Phase 1 Near surface geotechnical investigation

HOLE No: TP 14
Sheet 1 of 1

JOB NUMBER: 000

Scale
1:10



0.00

Slightly moist, light brown, intact, Medium dense, Coarse Sand. **TOPSOIL.**

0.48

Moist, light brown,intact, Medium dense, Gravelly sand. **Residual SOIL.**

1.10

Weathered yellowish hardrock granite. **BEDROCK.**

1.70

NOTES

1) Stable side walls
2) No water seepage encountered
3) Refusal encountered at 1.7 m
4) No disturbed sample taken
5) No Unditurbed sample taken

CONTRACTOR :
MACHINE : Tractor Loader Backhoe (TLB).
DRILLED BY :
PROFILED BY : Mavhetha Lavhelesani

INCLINATION :
DIAM : 0.7 m
DATE :
DATE : 12/11/2020

ELEVATION : 562m
X-COORD : 31°5’31.7"E
Y-COORD : 24°46’31.3"S

HOLE No: TP 14

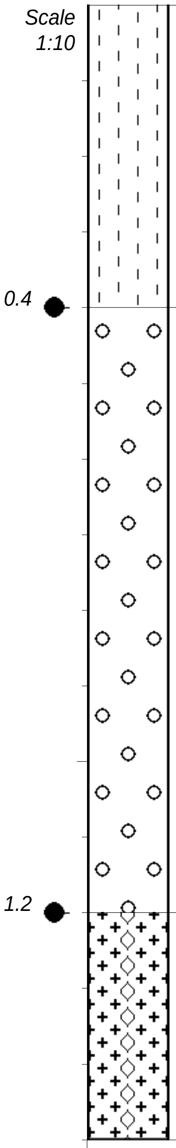
TYPE SET BY : Mavhetha Lavhelesani
SETUP FILE : STANDARD.SET

DATE : 06/12/2020 11:22
TEXT : ..00\Examples\Examples.TXT

Nkanivo Development Consultant
Phase 1 Near surface geotechnical investigation

HOLE No: TP 15
Sheet 1 of 1

JOB NUMBER: 000



0.00	Slightly moist, light brown, intact, dense, Silty Sand. **TOPSOIL.**
0.40	Moist, light brown,intact, Medium dense, Gravelly sand. **Residual SOIL.**
1.20	Weathered yellowish hardrock granite. **BEDROCK.**
1.50	

NOTES

1) Stable side walls
2) No water seepage encountered
3) Refusal encountered at 1.5 m
4) Disturbed sample taken at 0.4 - 1.2 m
5) No Unditurbed sample taken

CONTRACTOR :
MACHINE : Tractor Loader Backhoe (TLB).
DRILLED BY :
PROFILED BY : Mavhetha Lavhelesani

INCLINATION :
DIAM : 0.7 m
DATE :
DATE : 12/11/2020

ELEVATION : 579m
X-COORD : 31°5’30.3"E
Y-COORD : 24°46’24.2"S

HOLE No: TP 15

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

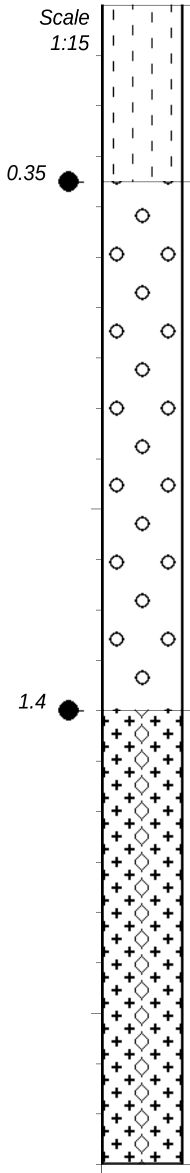
DATE : 06/12/2020 11:22
TEXT : ..00\Examples\Examples.TXT

Nkanivo Development Consultant
Phase 1 Near surface geotechnical investigation

HOLE No: TP 16
Sheet 1 of 1

JOB NUMBER: 000

Scale
1:15



0.00	Slightly moist, light brown, intact, dense, Silty Sand. **TOPSOIL.**
0.35	Moist, light brown,intact, Medium dense, Gravelly sand. **Residual SOIL.**
1.40	Weathered yellowish hardrock granite. **BEDROCK.**
2.30	

NOTES

1) Stable side walls
2) No water seepage encountered
3) Refusal encountered at 2.3 m
4) Disturbed sample taken at 0.35 - 1.4 m
5) No Undíturbed sample taken

CONTRACTOR :
MACHINE : Tractor Loader Backhoe (TLB).
DRILLED BY :
PROFILED BY : Mavhetha Lavhelesani

INCLINATION :
DIAM : 0.7 m
DATE :
DATE : 12/11/2020

ELEVATION : 581m
X-COORD : 31°5’25"E
Y-COORD : 24°46’20.2"S

HOLE No: TP 16

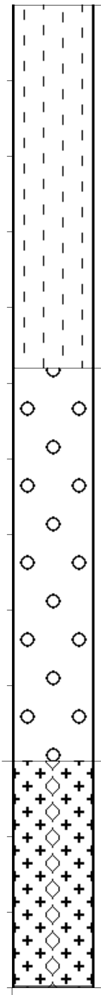
TYPE SET BY : Mavhetha Lavhelesani
SETUP FILE : STANDARD.SET
DATE : 06/12/2020 11:22
TEXT : ..00\Examples\Examples.TXT

Nkanivo Development Consultant
Phase 1 Near surface geotechnical investigation

HOLE No: TP 17
Sheet 1 of 1

JOB NUMBER: 000

Scale
1:10



0.00 Slightly moist, light brown, intact, dense, Silty Sand. **TOPSOIL.**

0.48 Moist, light brown,intact, Medium dense, Gravelly sand. **Residual SOIL.**

1.00 Refusal at hardrock granite. **BEDROCK.**

1.30

NOTES

1) Roots inclusion from a depth of 0 - 0.9m
2) Stable side walls
3) No water seepage encountered
4) Refusal encountered at 1.3 m
5) No disturbed sample taken
6) No Unditurbed sample taken

CONTRACTOR :
MACHINE : Tractor Loader Backhoe (TLB).
DRILLED BY :
PROFILED BY : Mavhetha Lavhelesani

INCLINATION :
DIAM : 0.7 m
DATE :
DATE : 12/11/2020

ELEVATION : 559m
X-COORD : 31°5’33.6"E
Y-COORD : 24°46’39.1"S

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

DATE : 06/12/2020 11:22
TEXT : ..00\Examples\Examples.TXT

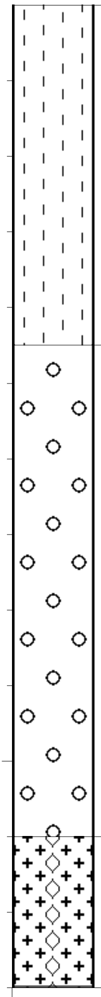
HOLE No: TP 17

Nkanivo Development Consultant
Phase 1 Near surface geotechnical investigation

HOLE No: TP 18
Sheet 1 of 1

JOB NUMBER: 000

Scale
1:10



0.00	Slightly moist, light brown, intact, <u>dense</u>, Silty Sand. **TOPSOIL.**
0.45	Moist, light brown,intact, <u>Medium</u> dense, Gravelly sand. **Residual SOIL.**
1.10	Refusal at hardrock granite. **BEDROCK.**
1.30	

NOTES

1) Roots inclusion from a depth of 0 - 0.4m
2) Stable side walls
3) No water seepage encountered
4) Refusal encountered at 1.3 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 : 12/11/2020

DATE : 06/12/2020 11:22
TEXT : ..00\Examples\Examples.TXT

ELEVATION : 548m
X-COORD : 31°5’15.55"E
Y-COORD : 24°46’39.58"S

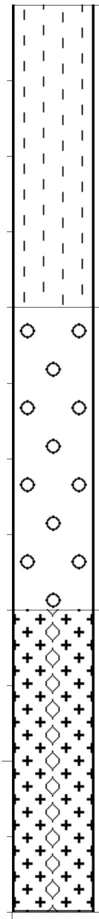
HOLE No: TP 18

Nkanivo Development Consultant
Phase 1 Near surface geotechnical investigation

HOLE No: TP 19
Sheet 1 of 1

JOB NUMBER: 000

Scale
1:10



0.00	Slightly moist, light brown, intact, dense, Silty Sand. **TOPSOIL.**
0.40	Moist, light brown,intact, Medium dense, Gravelly sand. **Residual SOIL.**
0.80	Weathered yellowish hardrock granite. **BEDROCK.**
1.20	

NOTES

1) Roots inclusion from a depth of 0 - 0.3m
2) Stable side walls
3) No water seepage encountered
4) Refusal encountered at 1.2 m
5) No disturbed sample taken
6) No Unditurbed sample taken

CONTRACTOR :
MACHINE : Tractor Loader Backhoe (TLB).
DRILLED BY :
PROFILED BY : Mavhetha Lavhelesani

INCLINATION :
DIAM : 0.7 m
DATE :
DATE : 12/11/2020

ELEVATION : 550m
X-COORD : 31°5’28.21"E
Y-COORD : 24°46’36.26"S

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

DATE : 06/12/2020 11:22
TEXT : ..00\Examples\Examples.TXT

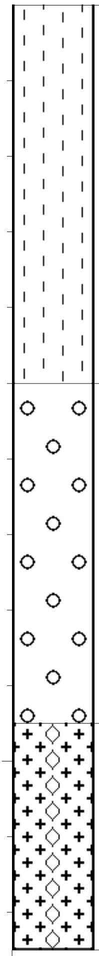
HOLE No: TP 19

Nkanivo Development Consultant
Phase 1 Near surface geotechnical investigation

HOLE No: TP 20
Sheet 1 of 1

JOB NUMBER: 000

Scale
1:10



0.00	Slightly moist, light brown, intact, <u>dense</u>, Silty Sand. **TOPSOIL.**
0.50	Moist, light brown,intact, <u>Medium</u> dense, Gravelly sand. **Residual SOIL.**
0.95	Weathered yellowish hardrock granite. **BEDROCK.**
1.25	

NOTES

1) Roots inclusion from a depth of 0 - 0.5m
2) Stable side walls
3) No water seepage encountered
4) Refusal encountered at 1.25 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 : 12/11/2020
DATE : 06/12/2020 11:22
TEXT : ..00\Examples\Examples.TXT

ELEVATION : 555m
X-COORD : 31°5’28.21"E
Y-COORD : 24°46’36.26"S

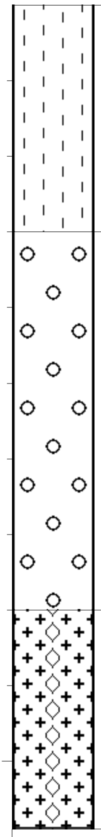
HOLE No: TP 20

Nkanivo Development Consultant
Phase 1 Near surface geotechnical investigation

HOLE No: TP 21
Sheet 1 of 1

JOB NUMBER: 000

Scale
1:10



0.00 Slightly moist, light brown, intact, dense, Silty Sand. **TOPSOIL.**

0.30 Moist, light brown,intact, Medium dense, Gravelly sand. **Residual SOIL.**

0.80 Weathered yellowish hardrock granite. **BEDROCK.**

1.09

NOTES

1) Roots inclusion from a depth of 0 - 0.3m
2) Stable side walls
3) No water seepage encountered
4) Refusal encountered at 1.09 m
5) No disturbed sample taken
6) No Unditurbed sample taken

CONTRACTOR :
MACHINE : Tractor Loader Backhoe (TLB).
DRILLED BY :
PROFILED BY : Mavhetha Lavhelesani

INCLINATION :
DIAM : 0.7 m
DATE :
DATE : 12/11/2020

ELEVATION : 557m
X-COORD : 31°5’6.92"E
Y-COORD : 24°46’38.26"S

HOLE No: TP 21

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

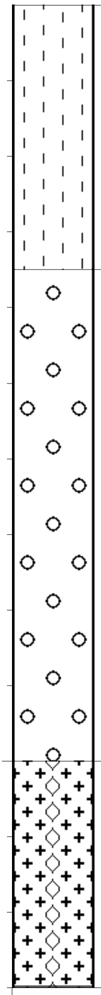
DATE : 06/12/2020 11:22
TEXT : ..00\Examples\Examples.TXT

Nkanivo Development Consultant
Phase 1 Near surface geotechnical investigation

HOLE No: TP 22
Sheet 1 of 1

JOB NUMBER: 000

Scale
1:10



0.00	Slightly moist, light brown, intact, dense, Silty Sand. **TOPSOIL.**
0.35	Moist, light brown,intact, Medium dense, Gravelly sand. **Residual SOIL.**
1.00	Weathered yellowish hardrock granite. **BEDROCK.**
1.30	

NOTES

1) Roots inclusion from a depth of 0 - 0.46m
2) Stable side walls
3) No water seepage encountered
4) Refusal encountered at 1.3 m
5) No disturbed sample taken
6) No Unditurbed sample taken

CONTRACTOR :
MACHINE : Tractor Loader Backhoe (TLB).
DRILLED BY :
PROFILED BY : Mavhetha Lavhelesani

INCLINATION :
DIAM : 0.7 m
DATE :
DATE : 12/11/2020

ELEVATION : 545m
X-COORD : 31°5’16.08"E
Y-COORD : 24°46’34.27"S

HOLE No: TP 22

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

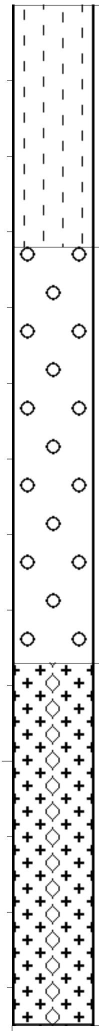
DATE : 06/12/2020 11:22
TEXT : ..00\Examples\Examples.TXT

Nkanivo Development Consultant
Phase 1 Near surface geotechnical investigation

HOLE No: TP 23
Sheet 1 of 1

JOB NUMBER: 000

Scale
1:10



0.00

Slightly moist, light brown, intact, dense, Silty Sand. **TOPSOIL.**

0.32

Moist, light brown,intact, Medium dense, Gravelly sand. **Residual SOIL.**

0.87

Weathered yellowish hardrock granite. **BEDROCK.**

1.35

NOTES

1) Roots inclusion from a depth of 0 - 0.4m
2) Stable side walls
3) No water seepage encountered
4) Refusal encountered at 1.35 m
5) No disturbed sample taken
6) No Unditurbed sample taken

CONTRACTOR :
MACHINE : Tractor Loader Backhoe (TLB).
DRILLED BY :
PROFILED BY : Mavhetha Lavhelesani

INCLINATION :
DIAM : 0.7 m
DATE :
DATE : 12/11/2020

ELEVATION : 556m
X-COORD : 31°5’23.24"E
Y-COORD : 24°46’33.93"S

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

DATE : 06/12/2020 11:22
TEXT : ..00\Examples\Examples.TXT

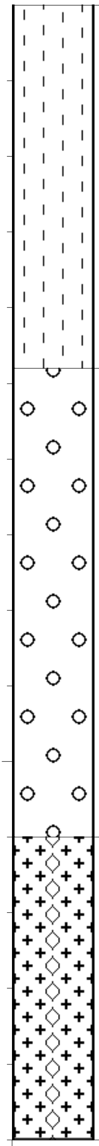
HOLE No: TP 23

Nkanivo Development Consultant
Phase 1 Near surface geotechnical investigation

HOLE No: TP 24
Sheet 1 of 1

JOB NUMBER: 000

Scale
1:10



0.00

Slightly moist, light brown, intact, dense, Silty Sand. **TOPSOIL.**

0.48

Moist, light brown,intact, Medium dense, Gravelly sand. **Residual SOIL.**

1.10

Weathered yellowish hardrock granite. **BEDROCK.**

1.50

NOTES

1) Roots inclusion from a depth of 0 - 0.45m
2) Stable side walls
3) No water seepage encountered
4) Refusal encountered at 1.5 m
5) No disturbed sample taken
6) No Unditurbed sample taken

CONTRACTOR :
MACHINE : Tractor Loader Backhoe (TLB).
DRILLED BY :
PROFILED BY : Mavhetha Lavhelesani

INCLINATION :
DIAM : 0.7 m
DATE :
DATE : 12/11/2020

ELEVATION : 550m
X-COORD : 31°5’12.92"E
Y-COORD : 24°46’30.26"S

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

DATE : 06/12/2020 11:22
TEXT : ..00\Examples\Examples.TXT

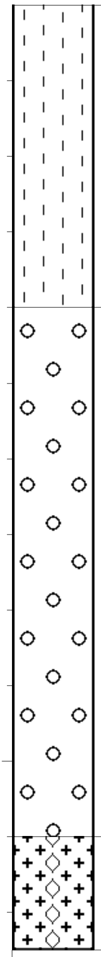
HOLE No: TP 24

Nkanivo Development Consultant
Phase 1 Near surface geotechnical investigation

HOLE No: TP 25
Sheet 1 of 1

JOB NUMBER: 000

Scale
1:10



0.00

Slightly moist, light brown, intact, dense, Silty Sand. **TOPSOIL.**

0.40

Moist, light brown,intact, Medium dense, Gravelly sand. **Residual SOIL.**

1.10

Refusal at hardrock granite. **BEDROCK.**

1.25

NOTES

1) Roots inclusion from a depth of 0 - 0.6m
2) Stable side walls
3) No water seepage encountered
4) Refusal encountered at 1.25 m
5) No disturbed sample taken
6) No Unditurbed sample taken

CONTRACTOR :
MACHINE : Tractor Loader Backhoe (TLB).
DRILLED BY :
PROFILED BY : Mavhetha Lavhelesani

INCLINATION :
DIAM : 0.7 m
DATE :
DATE : 12/11/2020

ELEVATION : 554m
X-COORD : 31°5’18.91"E
Y-COORD : 24°46’28.02"S

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

DATE : 06/12/2020 11:22
TEXT : ..00\Examples\Examples.TXT

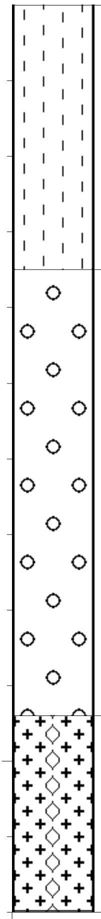
HOLE No: TP 25

Nkanivo Development Consultant
Phase 1 Near surface geotechnical investigation

HOLE No: TP 26
Sheet 1 of 1

JOB NUMBER: 000

Scale
1:10



0.00	Slightly moist, light brown, intact, <u>dense</u>, Silty Sand. **TOPSOIL.**
0.35	Moist, light brown,intact, <u>Medium</u> dense, Gravelly sand. **Residual SOIL.**
0.94	Weathered yellowish hardrock granite. **BEDROCK.**
1.20	

NOTES

1) Roots inclusion from a depth of 0 - 0.35m
2) Stable side walls
3) No water seepage encountered
4) Refusal encountered at 1.2 m
5) No disturbed sample taken
6) No Udisturbed 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 : 12/11/2020

DATE : 06/12/2020 11:22
TEXT : ..00\Examples\Examples.TXT

ELEVATION : 556m
X-COORD : 31°5’24.34"E
Y-COORD : 24°46’24.54"S

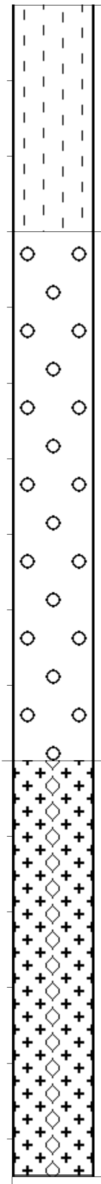
HOLE No: TP 26

Nkanivo Development Consultant
Phase 1 Near surface geotechnical investigation

HOLE No: TP 27
Sheet 1 of 1

JOB NUMBER: 000

Scale
1:10



0.00 Slightly moist, light brown, intact, dense, Silty Sand. **TOPSOIL.**

0.30 Moist, light brown,intact, Medium dense, Gravelly sand. **Residual SOIL.**

1.00 Weathered yellowish hardrock granite. **BEDROCK.**

1.55

NOTES

1) Roots inclusion from a depth of 0 - 0.47m
2) Stable side walls
3) No water seepage encountered
4) Refusal encountered at 1.55 m
5) No disturbed sample taken
6) No Unditurbed sample taken

CONTRACTOR :
MACHINE : Tractor Loader Backhoe (TLB).
DRILLED BY :
PROFILED BY : Mavhetha Lavhelesani

INCLINATION :
DIAM : 0.7 m
DATE :
DATE : 12/11/2020

ELEVATION : 561m
X-COORD : 31°5’7.80"E
Y-COORD : 24°46’25.91"S

HOLE No: TP 27

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

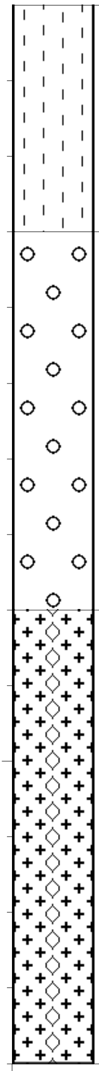
DATE : 06/12/2020 11:22
TEXT : ..00\Examples\Examples.TXT

Nkanivo Development Consultant
Phase 1 Near surface geotechnical investigation

HOLE No: TP 28
Sheet 1 of 1

JOB NUMBER: 000

Scale
1:10



0.00 Slightly moist, light brown, intact, dense, Silty Sand. **TOPSOIL.**

0.30 Moist, light brown,intact, Medium dense, Gravelly sand. **Residual SOIL.**

0.80 Weathered yellowish hardrock granite. **BEDROCK.**

1.40

NOTES

1) Roots inclusion from a depth of 0 - 0.7m
2) Stable side walls
3) No water seepage encountered
4) Refusal encountered at 1.4 m
5) No disturbed sample taken
6) No Unditurbed sample taken

CONTRACTOR :
INCLINATION :
ELEVATION : 551m
MACHINE : Tractor Loader Backhoe (TLB).
DIAM : 0.7 m
X-COORD : 31°5’13.91"E
DRILLED BY :
DATE :
Y-COORD : 24°46’25"S
PROFILED BY : Mavhetha Lavhelesani
DATE : 12/11/2020
HOLE No: TP 28
TYPE SET BY : Mavhetha Lavhelesani
DATE : 06/12/2020 11:22
SETUP FILE : STANDARD.SET
TEXT : ..00\Examples\Examples.TXT

Nkanivo Development Consultant
Phase 1 Near surface geotechnical investigation

LEGEND
Sheet 1 of 1

JOB NUMBER: 000

	○○○	GRAVEL	{SA02}
	○	GRAVELLY	{SA03}
	⁘	SANDY	{SA05}
	‖	SILT	{SA06}
	¦	SILTY	{SA07}
	+	GRANITE	{SA17}{SA44}
Name ●		DISTURBED SAMPLE	{SA38}
7.5 ○→		WATER SEEPAGE/water strike	{CH50}

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 : 06/12/2020 11:22
TEXT : ..00\Examples\Examples.TXT

LEGEND
SUMMARY OF SYMBOLS