

Final Geotechnical Investigation Report for Xesibe Senior Secondary School as Part of the Implementation of Sanitation Programme at Various Schools in the Eastern Cape Province



For



By

ILZ Consulting

Final Geotechnical Investigation Report for Xesibe Senior Secondary School as Part of the Implementation of Sanitation Programme at Various Schools in the Eastern Cape Province

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1 INTRODUCTION

iLZ Consulting (Pty) Ltd was appointed by The Mvula Trust to undertake geotechnical investigations at various schools for the Implementation of Sanitation Programme at Various schools in Eastern Cape Province (Sanitation 17).

The aim of the investigation was to:

- a. To assess the subsoil conditions pertaining to the site and their suitability for the proposed development,
- b. To provide foundation recommendation for the proposed development and to comment on the excavability of the site,
- c. To comment on any other geotechnical aspect of the site.

This report contains results of the geotechnical investigation carried out at **Xesibe Senior Secondary School**, highlighting the following

- General soil/rock profile on-site,
- Groundwater occurrence,
- Excavability classification,
- Recommendations for foundations.

Although considered unlikely, should significant variations from the inferred conditions become apparent during construction, the advice of a geotechnical professional must be sought.

2 INFORMATION AVAILABLE

Information made available to or sourced by iLZ at the time of investigation comprised of the following:

- Terms of reference
- Site Development Plan (Google Earth image with test positions)
- GPS Coordinates of the schools
- 1:250 000 Geological Map Sheets

3 SITE LOCATION AND ACCESSIBILITY

Xesibe Senior Secondary School is located in Mbongweni, a village approximately 12km east of eMaxesibeni (Mount Ayliff), under the Alfred Nzo District Municipality in the Eastern Cape Province, South Africa. Access is via a tarred road and gravel roads from eMaxesibeni (Mount Ayliff) (see

Figure 3-1). The school has 2 classroom blocks, an admin block, a park home classroom, and 3 existing toilets for learners and teachers.

The approximate central coordinates are -30.791246° Lat and 29.469062° Long. The coordinates are WGS84.

Topographically, the site is located on a relatively gentle towards the east terrain with grass cover.

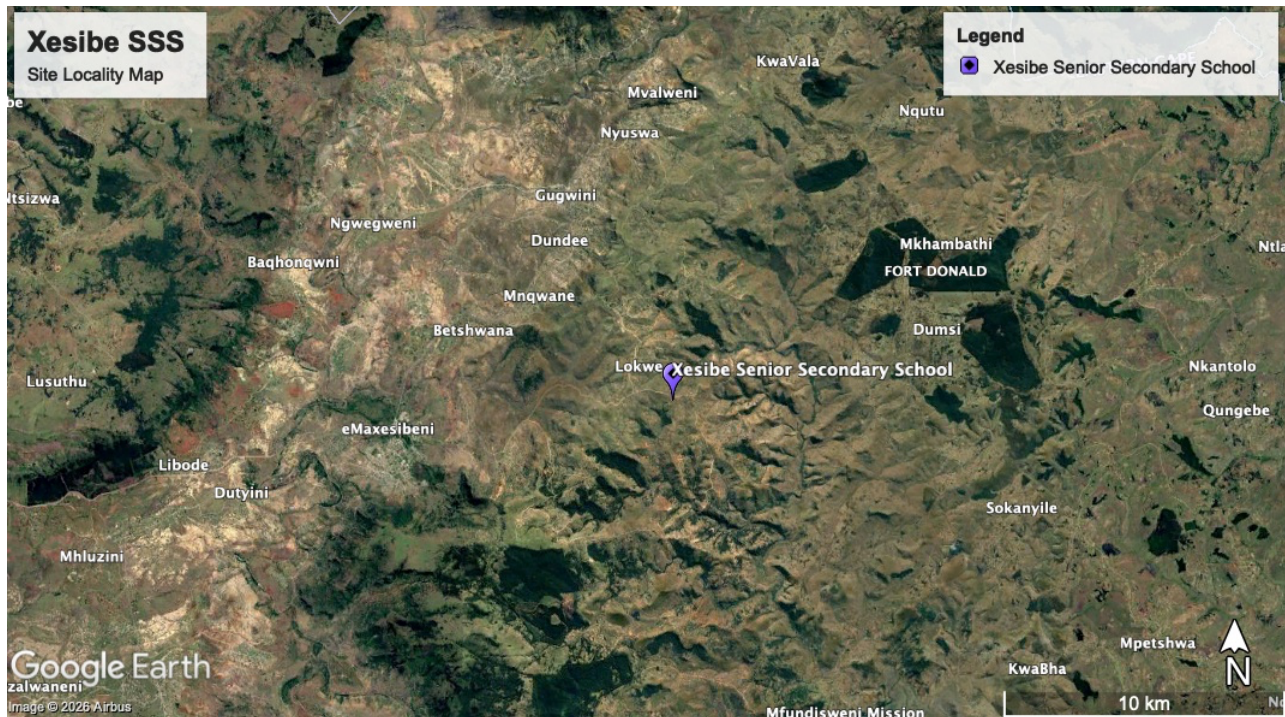


Figure 3-1: Locality Map relative to eMaxesibeni.

4 FIELD WORK

Geotechnical site investigation was undertaken on the 12th of June 2026 and comprised of the following:

- Siting of 2 trial pits using SDP's of where the proposed structures positions:
 - New ablutions (boys, girls, and staff)
- Test pits were excavated using hand tools and profiled by an Engineering Geologist using SANS 633 guidelines.
- Penetrometer tests (DCP) tests were conducted adjacent to each trial pit

These positions are all marked in **Figure 4-1** below as per the provided SDP.



Figure 4-1: Trial pit positions.

4.1 Soil/rock Profiling

Two trial pits, labelled TP1 and TP2, were excavated manually with pick and shovel at locations designated for the proposed new ablutions, i.e. proposed positions as per SDP. The excavation focused on areas planned for boys, girls and staff. The trial pits were all excavated to a maximum depth of 1.50 meters below the existing ground level (mbgl).

The subsoils were profiled by an Engineering Geologist following the SANS 633 guidelines.

4.2 Dynamic Cone Penetrometer (DCP) Test

Two Dynamic Cone Penetrometer tests (DCP), designated DCP1 and DCP2, were conducted adjacent to the test pits. The tests were all advanced to a maximum depth of 2.50 mbgl. The tests were done to primarily ascertain excavation classification and to estimate the bearing capacity of the local soils.

5 REGIONAL GEOLOGY

According to **3028 Kokstad** 1:250 000 Geological Map Series, the site is underlain by the Tarkastad Subgroup (TRt) sandstones and mudstones as shown in **Figure 5-1** below.

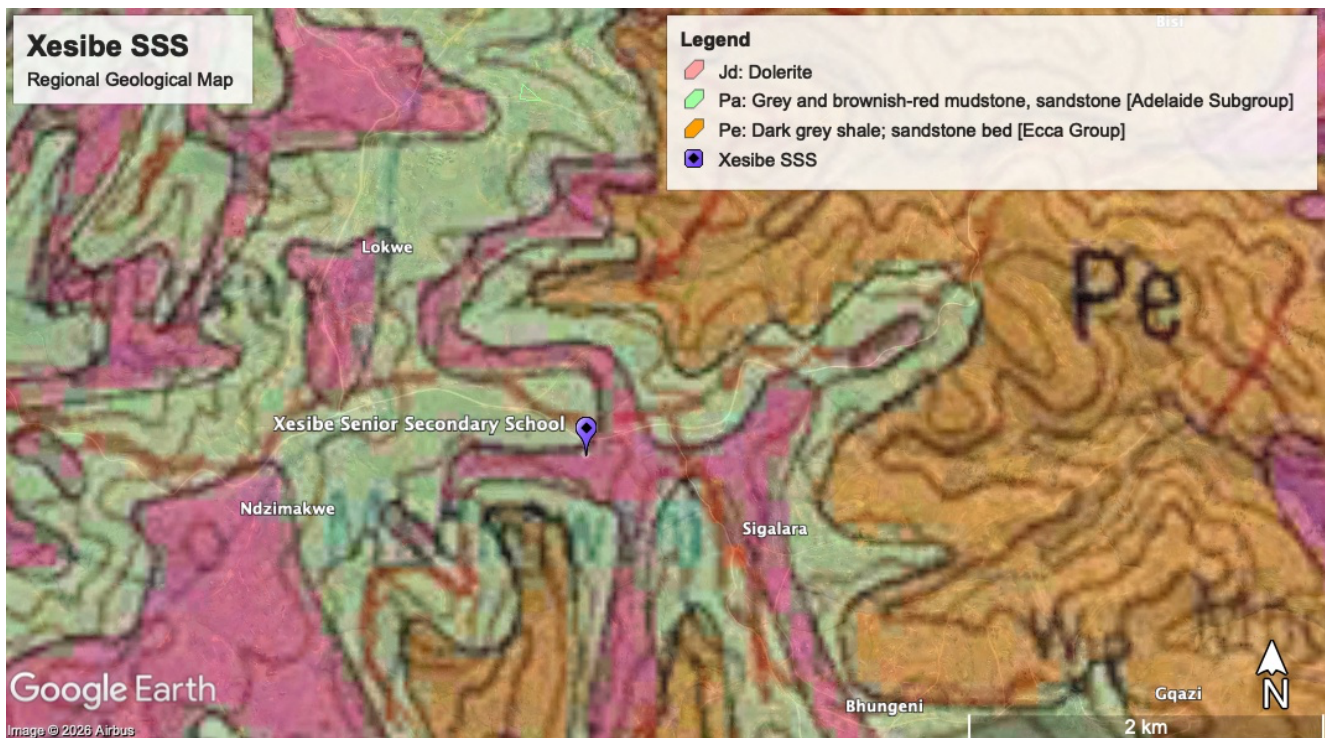


Figure 5-1: Regional geology of the site.

5.1 Local Geology

Field investigations show that the site is underlain by colluvial soils which overlie the residual mudstone in TP1 and TP2.

The detailed logs are attached in **Appendix A** of this report, while a description of each layer is given below.

5.1.1 Colluvium

This horizon was encountered throughout the site at depths ranging from surface to 0.20m overlying the residual sandstone. It was described as slightly moist, brown, soft, intact, fine to medium grained, sandy silt with roots.

5.1.2 Residual Mudstone

These soils are derived from the complete weathering of the existing underlying bedrock. They were encountered underlying the colluvial soils in all pits at depths ranging from 0.20 to 1.50m below existing ground level. It was described as moist, orangey brown, firm, intact, fine to medium grained, sandy clay to silty clay from 0.70m.

5.2 Groundwater Occurrence

No groundwater seepage was encountered during the investigation.

However, perched groundwater levels may be encountered at the soil/rock interface during rainy season. If encountered during construction, it will need to be removed from foundations through dewatering.

6 LABORATORY TEST RESULTS

In order to assess more accurately the engineering properties of the various materials encountered on site and their suitability for use for construction of road layers, the following materials classification tests were carried out on selected samples during the investigation:

- Atterberg Limit and Linear Shrinkage Determinations
- Mod AASHTO and California Bearing Ratio
- Hydrometer

A summary of the laboratory results is presented below in **Table 6-1** and the detailed results are included in **Appendix C**.

Table 6-1: Summary of Results of Particle Size Distribution Analysis, Atterberg Limit Determinations, MOD AASHTO and CBR Tests.

Pit No.	Depth (m)	Atterberg Limits %			GM	Modified AASHTO		CBR Values (%)				Classification and Activity
		LL	PI	LS		MDD (kgm3)	OMC %	90	93	95	100	
TP1	0.20-0.70	43	14	7.5	0.08							A-7-6(16), LOW
TP1	0.20-0.70	43	14	7.5	0.08	1476	28.4	3.6	5.4	7.1	14	A-7-6(16), G10

LL - Liquid Limit
 LS - Linear Shrinkage
 PI - Plasticity Index

MDD – Maximum Dry Density
 OMC – Maximum Moisture Content
 GM – Grading Modulus

7 MATERIAL CLASSIFICATION AND USAGE

The laboratory test results, and the visual assessment conducted on-site have been used as an indication of suitability for use of the materials encountered on-site for the construction of pavement layers.

The classification and recommended usage are summarized in **Table 7-1** below.

Table 7-1: Material Classification and Usage.

Material Type	Classification Details	Recommended Use and Subgrade Treatment
Residual Sandstone	PI = 14 LS = 7.5 GM = 0.08 Classify as, A-7-6(16) and G10 in terms of TRH14. It has low heave potential.	Poor subgrade quality. Can be used as a general subgrade layer.

8 GEOTECHNICAL APPRAISAL

8.1 Bearing Capacity

Dynamic Cone Penetration can assist in determining the estimated allowable safe bearing pressures (EASBP) of the soils. **Appendix B** shows that EASBP on the residual soil ranges between 31kPa to 184kPa.

8.2 Site Classification

The evaluation of the foundation soils and subsequent classification of the site into foundation classes has been carried along the guidelines as proposed by Watermayer and Tromp (1992) and the Structural Division of the SAICE as prescribed by the NHBRC. Based on the geology and the soil profiles encountered during investigation; the site class for is **H1**.

Table 8-1: NHBRC Residential Site Classification.

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	NEGLECTIBLE	-	R
Fine grained soils with moderate to very high plasticity (clays, silty clays, clayey silts and sandy clays)	EXPANSIVE SOILS	< 7,5 7,5 – 15 15 – 30 > 30	50% 50% 50% 50%	H H1 H2 H3
Silty sands, sands, sandy and gravelly soils	COMPRESSIBLE AND POTENTIALLY COLLAPSABLE SOILS	<5 5-10 >10	75% 75% 75%	C C1 C2
Fine grained soils (clayey silts and clayey sands of low plasticity), sands, sandy and gravelly soils	COMPRESSIBLE SOILS	<10 10-20 >20	50% 50% 50%	S S1 S2
Contaminated soils, Controlled fill, Dolomitic areas, Landslip, Landfill, Marshy areas Mine waste fill, mining subsidence Reclaimed areas, Uncontrolled fill, Very soft silts/silty clays	VARIABLE	VARIABLE		P

8.3 Foundation Recommendations

- Position TP1 and TP2
 - The proposed location is underlain by colluvial soils and residual mudstone. The residual soils comprise of sandy to silty clays with consistencies. These may be classified as **H1/S1** according to NHBRC. Based on the former and penetrometer tests, the structures should therefore be placed on the residual soils using raft foundations.

Reinforcement of the foundations will be determined by the Structural Engineer based on the prevailing site conditions.

8.4 Excavatibility

SANS 1200 has been used to assess the excavatibility of the material underlying the site. The SANS 1200 excavation classification are shown in **Table 8-2** below.

Table 8-2: SANS 1200D excavation class descriptions- restricted excavation.

Excavation Class	Description
Soft	Excavation in material that can be efficiently removed by a back-acting excavator of flywheel power approximately 0.10 kW per millimetre of tined-bucket width, without the use of pneumatic tools such as paving breakers
Intermediate	Excavation in material that requires a back-acting excavator of flywheel power exceeding 0.10 kW per millimetre of tined-bucket width or the use of pneumatic tools before removal by equipment equivalent to that specified for soft excavation.

Excavation Class	Description
Hard	Hard rock excavation shall be excavation in material (excluding boulder excavation) that cannot be efficiently removed without blasting or wedging and splitting.
Boulder (excavation class A)	Excavation in material containing more than 40% by volume of boulders of size in the range of 0.03-20m ³ , in a matrix of soft or smaller boulders.

Based on the site investigation i.e. trial pit profile and penetrometer tests, the ease of excavation according to SANS 1200D can be expected as shown in **Table 8-3** below. Furthermore, the excavation classification for 1.5 to 2.5m has been inferred based on the penetrometer tests.

Table 8-3: Excavation classification

Location	Excavation classification	
	0-1.5m	1.5-2.5m
Position TP1	Soft	Soft
Position TP2	Soft	Soft

9 CONCLUSION

This final report contains the results of a geotechnical investigation carried out for the proposed new ablutions facilities at Xesibe Senior Secondary School.

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

The material classifies as G10 according to TRH14, thus it is suitable for use as a general subgrade layer.

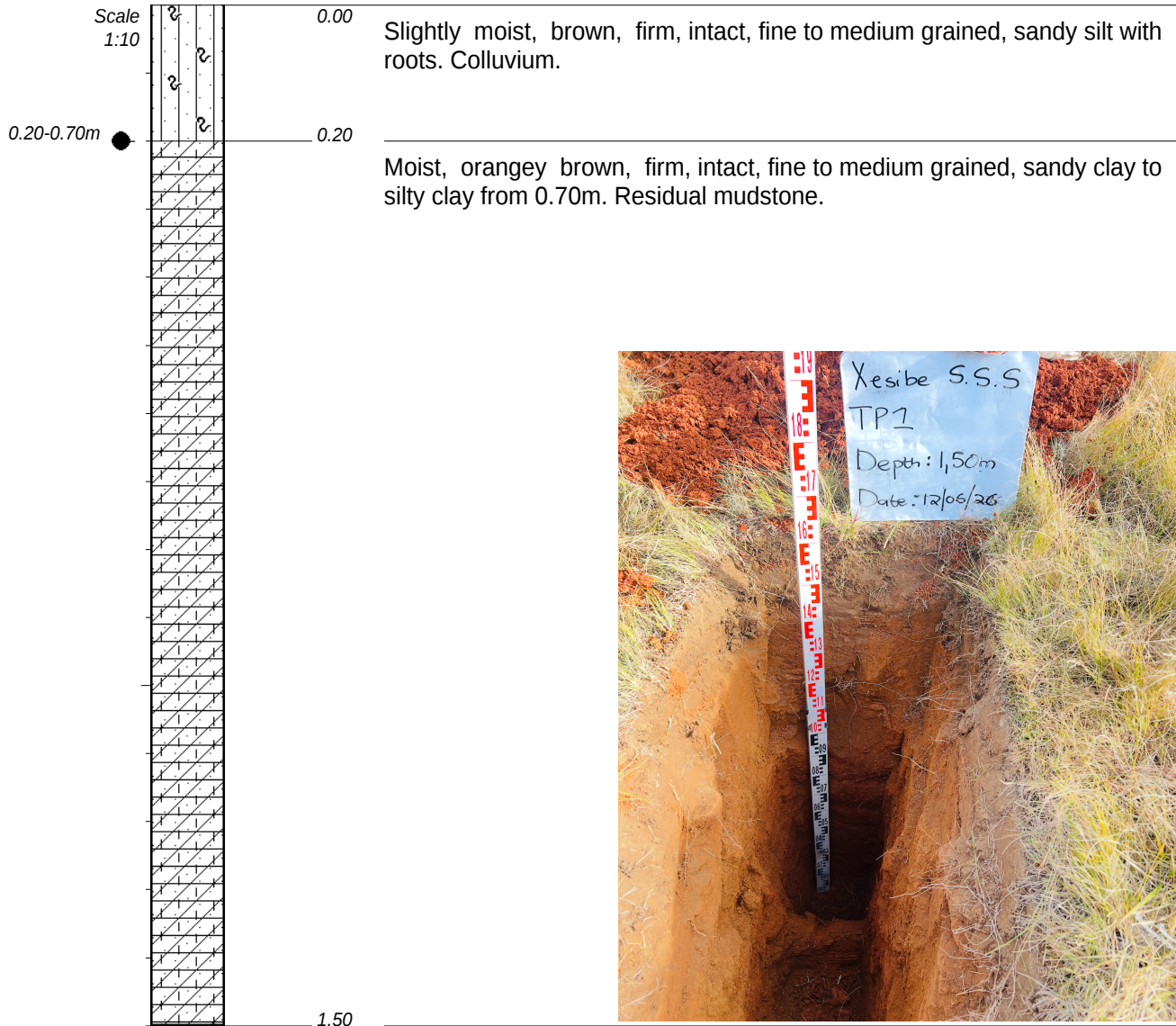
Finally, the ground conditions described in this report refer specifically to those encountered in the inspection pits and DCP tests conducted on-site.

It is therefore quite possible that conditions at variance with those discussed above can be encountered elsewhere. It is advised that a competent person be called to advise on the way forward should conditions at variance be encountered.

10 REFERENCES

- SANS 633: Soil profiling and rotary percussion borehole logging on dolomite land in Southern Africa for engineering purposes, 2012.
- 1: 250 000 Scale Geological Map. Sheet **3028 Kokstad**. Published by South African Council for Geoscience.
- Code of Practice _ the Safety of Persons Working in Small Diameter Shafts and Test Pits for Civil Engineering Purposes – Geotechnical Division of SAICE –2003.
- Draft TMH 6. Special Methods. Method ST6. Measurement of the In Situ Strength of Soils by the Dynamic Cone Penetrometer (DCP), (1984).
- SANS 10400-P (2010): The application of the National Building Regulations Part P: Drainage

APPENDIX A: GEOLOGICAL PROFILES



NOTES

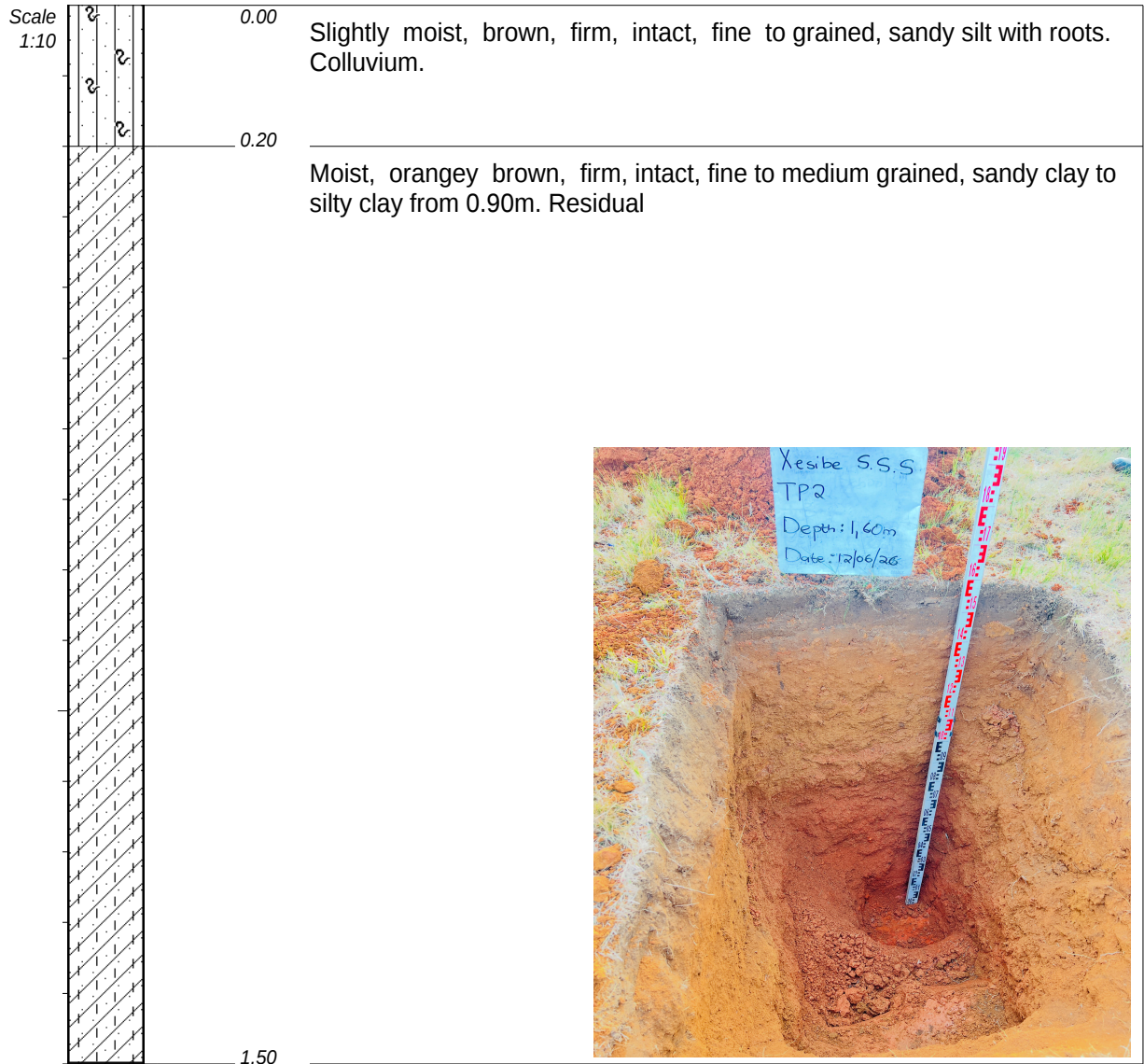
- 1) End of hole at 1.50m on residual mudstone.
- 2) No groundwater seepage.
- 3) No sidewall collapse.
- 4) MOD-CBR-ind sample at 0.20-0.70m.

CONTRACTOR :
MACHINE : Pick and Shovel
DRILLED BY :
PROFILED BY : A Mdlalose
TYPE SET BY : A Mdlalose
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM :
DATE :
DATE : 12/06/2026
DATE : 01/07/2026 11:22
TEXT : ..beSSS\Logs\XesibeSSS.txt

ELEVATION :
X-COORD : 29.469494°
Y-COORD : -30.791213°

HOLE No: TP1



NOTES

- 1) End of hole at 1.50m on residual mudstone.
- 2) No groundwater seepage.
- 3) No sidewall collapse.

CONTRACTOR :
MACHINE : Pick and Shovel
DRILLED BY :
PROFILED BY : A Mdlalose
TYPE SET BY : A Mdlalose
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM :
DATE :
DATE : 12/06/2026
DATE : 01/07/2026 11:22
TEXT : ..beSSS\Logs\XesibeSSS.txt

ELEVATION :
X-COORD : 29.469642°
Y-COORD : -30.791298°

HOLE No: TP2

JOB NUMBER: 26_056_Xesibe SSS

Name ●		SANDY	{SA05}
		SILT	{SA06}
		SILTY	{SA07}
		CLAY	{SA08}
		MUDSTONE	{SA12}
		DISTURBED SAMPLE	{SA38}
		ROOTS	{SA40}

CONTRACTOR :
 MACHINE :
 DRILLED BY :
 PROFILED BY :

TYPE SET BY : A Mdlaose
 SETUP FILE : STANDARD.SET

INCLINATION :
 DIAM :
 DATE :
 DATE :

DATE : 01/07/2026 11:22
 TEXT : ..beSSS\Logs\XesibeSSS.txt

ELEVATION :
 X-COORD :
 Y-COORD :

LEGEND
 SUMMARY OF SYMBOLS

APPENDIX B: PENETROMETER TEST RESULTS



APPROXIMATE INSITU CBR FROM DCP

Project Name Xesibe SSS

Date 2026/06/12

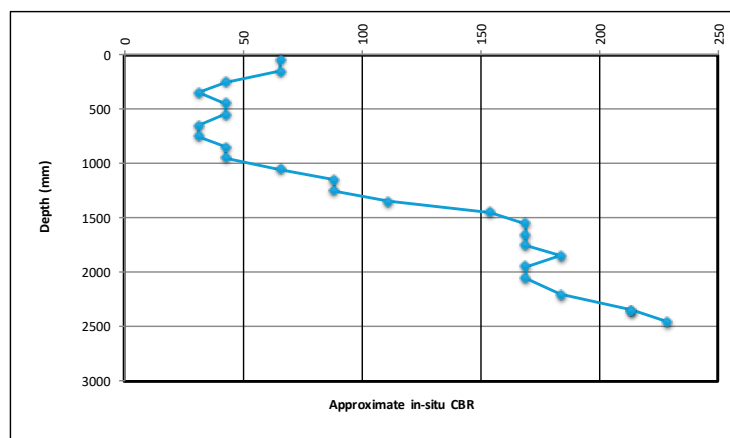
DCP No. 1

Hammer size 8kg with 20mm point

Applied Factor : 1 times Terzaghi's value

Applied Factor : 1 times Terzaghi's value

SPT = 1.2 DN



Penetration Guide		
SPT mm/blow	DCP DN	Consistency
75 - 100	132-210	Very Dense
30 - 75	78-132	Dense
10 - 30	25-78	Med Dense
5 - 10	10 - 25	Loose
< 5	<10	Very Loose

NOTE :
Stated consistencies
do not apply to
cohesive materials.
Describe using "stiff
or firm or soft".

Depth of hole in which DCP was taken : 0 mm below NGL

note: EASBP from Terzaghi & Peck p491 for 25mm settlement

Reading No.	Layer From	Layer To	Average Layer Depth	DCP DN Blows/100mm	Level Below NGL mm	DCP penetration mm/blow	Equiv. SPT N Value	Approx In-situ CBR	Approx EASBP kPa
1	0	100	50	4	50	25	5	7	66
2	100	200	150	4	150	25	5	7	66
3	200	300	250	2	250	50	2	3	43
4	300	400	350	1	350	100	1	0	31
5	400	500	450	2	450	50	2	3	43
6	500	600	550	2	550	50	2	3	43
7	600	700	650	1	650	100	1	0	31
8	700	800	750	1	750	100	1	0	31
9	800	900	850	2	850	50	2	3	43
10	900	1000	950	2	950	50	2	3	43
11	1000	1100	1050	4	1050	25	5	7	66
12	1100	1200	1150	6	1150	17	7	12	88
13	1200	1300	1250	6	1250	17	7	12	88
14	1300	1400	1350	8	1350	13	10	17	111
15	1400	1500	1450	9	1450	11	11	20	154
16	1500	1600	1550	10	1550	10	12	23	169
17	1600	1700	1650	10	1650	10	12	110	169
18	1700	1800	1750	10	1750	10	12	23	169
19	1800	1900	1850	11	1850	9	13	26	184
20	1900	2000	1950	10	1950	10	12	23	169
21	2000	2100	2050	10	2050	10	12	23	169
22	2100	2300	2200	11	2200	18	13	10	184
23	2300	2400	2350	13	2350	8	16	111	213
24	2300	2400	2350	13	2350	8	16	32	213
25	2400	2500	2450	14	2450	7	17	113	228

APPROXIMATE INSITU CBR FROM DCP

Project Name Xesibe SSS

Date 2026/06/12

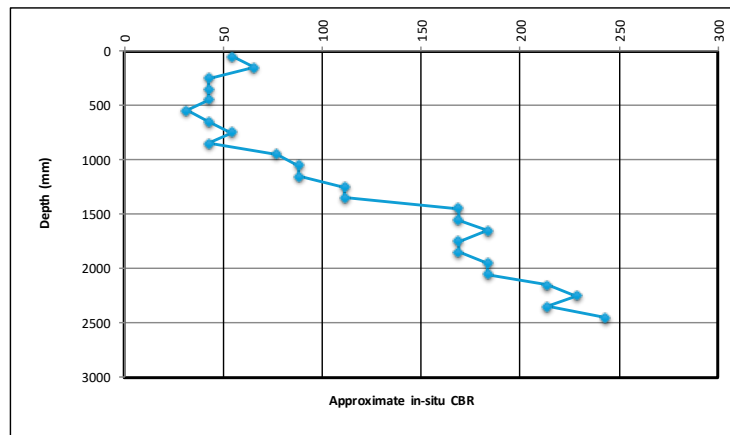
DCP No. 2

Hammer size 8kg with 20mm point

Applied Factor : 1 times Terzaghi's value

Applied Factor : 1 times Terzaghi's value

SPT = 1.2 DN



Penetration Guide		
SPT mm/blow	DCP DN	Consistency
75 - 100	132-210	Very Dense
30 - 75	78-132	Dense
10 - 30	25-78	Med Dense
5 - 10	10 - 25	Loose
< 5	<10	Very Loose

NOTE :

Stated consistencies
do not apply to
cohesive materials.
Describe using "stiff
or firm or soft".

Depth of hole in which DCP was taken : 0 mm below NGL
note: EASBP from Terzaghi & Peck p491 for 25mm settlement

Reading No.	Layer From	Layer To	Average Layer Depth	DCP DN Blows/100mm	Level Below NGL mm	DCP penetration mm/blow	Equiv. SPT N Value	Approx In-situ CBR	Approx EASBP kPa
1	0	100	50	3	50	33	4	5	54
2	100	200	150	4	150	25	5	7	66
3	200	300	250	2	250	50	2	3	43
4	300	400	350	2	350	50	2	3	43
5	400	500	450	2	450	50	2	3	43
6	500	600	550	1	550	100	1	0	31
7	600	700	650	2	650	50	2	3	43
8	700	800	750	3	750	33	4	5	54
9	800	900	850	2	850	50	2	3	43
10	900	1000	950	5	950	20	6	9	77
11	1000	1100	1050	6	1050	17	7	12	88
12	1100	1200	1150	6	1150	17	7	12	88
13	1200	1300	1250	8	1250	13	10	17	111
14	1300	1400	1350	8	1350	13	10	17	111
15	1400	1500	1450	10	1450	10	12	23	169
16	1500	1600	1550	10	1550	10	12	23	169
17	1600	1700	1650	11	1650	9	13	110	184
18	1700	1800	1750	10	1750	10	12	23	169
19	1800	1900	1850	10	1850	10	12	23	169
20	1900	2000	1950	11	1950	9	13	26	184
21	2000	2100	2050	11	2050	9	13	26	184
22	2100	2200	2150	13	2150	8	16	32	213
23	2200	2300	2250	14	2250	7	17	111	228
24	2300	2400	2350	13	2350	8	16	32	213
37	2400	2500	2450	15	2450	7	18	39	243

APPENDIX C: LABORATORY TEST RESULTS

CLIENT : ILZ Consulting (Pty) Ltd
 PHYSICAL ADDRESS: Unit 4, 36 Alexander Road, Westmead, 3610
 ATTENTION : Mr A.I. Mdlalose
 PROJECT : Xesibe SSS

TEST REPORT REFERENCE NUMBER: 101223

Dear Sir/Madam,

Enclosed herewith, please find the original reports pertaining to the above-mentioned project.

Date Received	17.06.2026						
Date Tested	22.06.2026 to 27.06.2026						
Sample Location	Refer to report						
Sampling Method	Unknown						
Sample Condition	Good						
Sampling Environmental Condition	Unknown						
Sampler(s) Name	Client						
Total Number of Pages	6						
Test Carried Out							
SANS3001 GR1	☒	SANS3001 GR11		SANS3001 AS1		SANS3001 AS2	
SANS3001 GR10	☒	SANS3001 GR12	☒	SANS3001 AS10		SANS3001 AG11	
SANS3001 GR20		SANS3001 GR30	☒	SANS3001 AS20		SANS3001 AG1	
SANS3001 GR31		SANS3001 GR40	☒	SANS3001 AG2/3		SANS3001 AG4	
SANS3001 GR50		SANS3001 GR51		SANS3001 AG5		SANS3001 AG10	
SANS3001 GR52		SANS3001 GR53		SANS3001 AG14		SANS3001 AG13	
SANS3001 GR54		SANS3001 GR55		SANS3001 AG20		SANS3001 AG21	
SANS3001 GR57		SANS3001 GR58		SAN5833		SANS3001 AG23	
SANS3001 GR5		ASTM D422	☒	SABS 865:1994#		SANS5849	
SANS3001 GR60		SANS3001 GR61		SANS6243		SANS6245	
TMH6 ST6#		SANS5836		ASTM D5		ASTM D36	
SANS3001 C03-2		SANS5831		UCT Manual Part 3		TMH1 B9	
☒	- Tick denotes tests that were carried out.			#De-notes non-accredited test method			



- Tick denotes tests that were carried out.

#De-notes non-accredited test method

We would like to take this opportunity of thanking you for your continued support.

Should you have any queries please do not hesitate to contact me.

Refer to Appendix A for Uncertainty of Measurement and notes on the Decision Rule

Yours faithfully



Technical Signatory,

Darren Samuel for Geosure (Pty) Ltd.

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LABORATORY AND HEAD OFFICE ADDRESS:	Reg.No.: 92/03145/07 122 Intersite Avenue, Umgeni Business Park, Durban, 4091		
LABORATORY CONTACT INFO.:	Tel.: +27(0) 31 701 9732	Fax: 086 684 9785	
	Mobile: +27(0) 72 870 2621	e-mail: lab@geosure.co.za	
HEAD OFFICE CONTACT INFO.:	Tel.: +27(0) 31 266 0458	Fax: 086 689 5506	
	Mobile: +27(0) 82 784 0544	e-mail: geosure@iafrica.com	
WEBSITE:	www.geosure.co.za		

Client : ILZ Consulting (Pty) Ltd
Project : Xesibe SSS

Our Ref. : 101223

Your Ref. : 26_056_Xesibe SSS

Date Tested : 23.06.2026 to 25.06.2026

Attention : Mr A.I. Mdlalose

Date Reported : 29.06.2026

Sample No.	T61900				
Field No.	TP1				
Position in Field	-				
Depth (m)	0.20-0.70				
Material Description	Light reddish orange brown clayey SILT (Residual Sandstone)				

Sieve Analysis (Wet Preparation) - SANS3001 GR 1 - Percent Passing Sieve Size

% Passing	100.0 mm	100			
	75.0 mm	100			
	63.0 mm	100			
	50.0 mm	100			
	37.5 mm	100			
	28.0 mm	100			
	20.0 mm	100			
	14.0 mm	100			
	5.00 mm	100			
	2.00 mm	100			
	0.425 mm	98			
	0.250 mm	98			
	0.150 mm	97			
	0.075 mm	94			

Hydrometer Analysis - ASTM - D422 - Percent Passing Particle Diameter (<0.425mm)

% Passing	0.060 mm	79			
	0.050 mm	68			
	0.040 mm	58			
	0.026 mm	43			
	0.015 mm	35			
	0.010 mm	29			
	0.0074 mm	23			
	0.0036 mm	18			
	0.0020 mm	12			
	0.0015 mm	10			

Mechanical analysis - SANS3001 GR1 - Percent of Soil Mortar (<2 mm) for Grain Size range

Coarse Sand	%	1			
Coarse Fine Sand	%	0			
Medium Fine Sand	%	0			
Fine Fine Sand	%	3			
Silt & Clay	%	95			
Grading Modulus		0.08			

Atterberg Limits - SANS3001 GR10, GR12 (<0.425mm)

Liquid Limit	%	43			
Plasticity Index	%	14			
Linear Shrinkage	%	7.5			
AASHTO Classification (Group Index)*		A-7-6 (16)			
Unified Classification*		ML/OL±			
Moisture Content	%				

Remarks: Date Received: 17.06.2026

Sampled by Client.

*Opinions expressed herein fall outside the scope of SANAS accreditation.

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Reg.No.: 92/03145/07		
LABORATORY AND HEAD OFFICE ADDRESS:	122 Intersite Avenue, Umgeni Business Park, Durban, 4091	
LABORATORY CONTACT INFO.:	Tel.: +27(0) 31 701 9732	Fax: 086 684 9785
	Mobile: +27(0) 72 870 2621	e-mail: lab@geosure.co.za
HEAD OFFICE CONTACT INFO.:	Tel.: +27(0) 31 266 0458	Fax: 086 689 5506
	Mobile: +27(0) 82 784 0544	e-mail: geosure@lafrica.com
WEBSITE:	www.geosure.co.za	

Client : ILZ Consulting (Pty) Ltd

Job No. : 101223

Project : Xesibe SSS

Your Ref.No. : 26_056_Xesibe SSS

Date Tested : 23.06.2026 to 25.06.2026

Attention : Mr A.I. Mdlalose

Date Reported : 29.06.2026

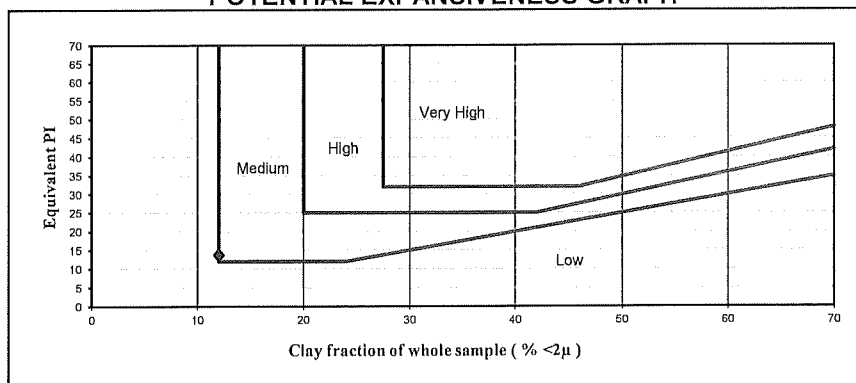
Sample Number : T61900

Field No. : TP1

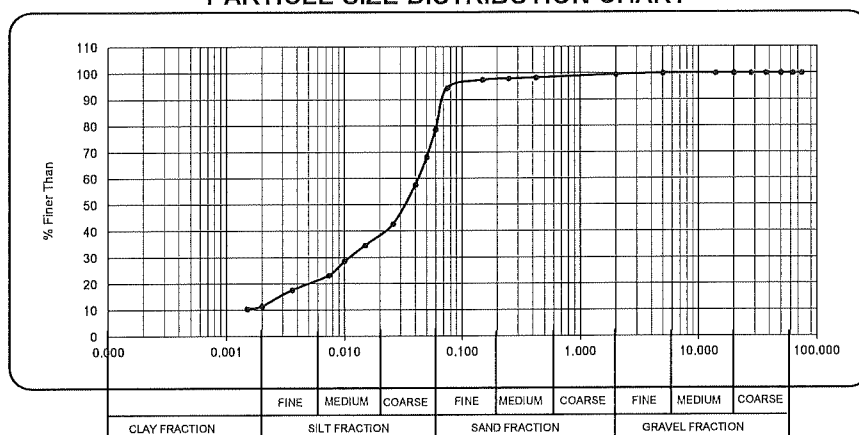
Sample Description : Light reddish orange brown clayey SILT (Residual Sandstone)

Equivalent PI : 14 Clay fraction of whole sample (% <2 μ) : 12

POTENTIAL EXPANSIVENESS GRAPH



PARTICLE SIZE DISTRIBUTION CHART



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LABORATORY: 122 Intersite Avenue, Umgeni Business Park, Durban, 4091 P.O. Box 1461, Westville 3630 Mobile: +27(0)72 870 2621 Tel.: +27 (0)31 701 9732	Reg. No. : 92/03145/07 Fax: 086 684 9785 email: lab@geosure.co.za	HEAD OFFICE: 122 Intersite Avenue, Umgeni Business Park, Durban, 4091, KwaZulu Natal, South Africa. Tel: +27 (0)31 266 0458 Fax: 086 689 5506 email: geosure@lafrica.com www.geosure.co.za
--	--	--

Client	: ILZ Consulting (Pty) Ltd	Your Ref No. : 26_056_Xesibe
Project	: Xesibe SSS	Our Ref No. : 101223
Attention	: Mr A.I. Mdilalose	Date Reported : 01/07/2026

Test Report - SANS 3001

Sample No.	T61900				
Field No.	TP1				
Position	-				
Depth (m)	0.20-0.70				
Method of Preparation	N/A				
Material Description	Light reddish brown orange brown clayey SILT (Residual Mudstone)				

Sieve Analysis - Percent Passing Sieve Size

Sieve Aperture (mm)	100.00					
	75.00					
	63.00					
	53.00					
	50.00					
	37.50					
	28.00					
	26.50					
	20.00					
	19.00					
	14.00					
	13.20					
	5.00					
	4.750					
	2.000	100				
0.425	98					
0.075	94					
Grading Modulus		0.08				

Mechanical analysis - Percent of Soil Mortar (<2 mm) for Grain Size range

Coarse Sand	2.000 - 0.425	1				
Coarse-Fine Sand	0.425 - 0.250	0				
Medium-Fine Sand	0.250 - 0.150	0				
Fine-Fine Sand	0.150 - 0.075	3				
Silt and Clay	< 0.075	95				

Atterberg Limits SANS 3001 on <0.425 mm fraction

Liquid Limit	% or symbol	43				
Plasticity Index	% or symbol	14				
Linear Shrinkage	%	7.5				

Maximum Dry Density and Optimum Moisture Content

Maximum Dry Density (kg/m³)	1476				
Optimum moisture content (%)	28.4				

California Bearing Ratio

CBR @100% Compaction	%	14				
CBR @ 98% Compaction	%	11				
CBR @ 97% Compaction	%	9.3				
CBR @ 95% Compaction	%	7.1				
CBR @ 93% Compaction	%	5.4				
CBR @ 90% Compaction	%	3.6				
Swell @100% Compaction	%	0.1				

COLTO Classification (1998)**	Cannot be Determined				
TRH 14 Classification (1985)**	G10				
AASHTO Classification (Group Index)**	A-7-6 (16)				
Unified Classification **	ML/OL†				

† If $LL_{(oven\ dried)} / LL_{(not\ dried)} < 0.75$ then use O-symbol (Organic Material).

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Remarks: *Subject to further testing as required by TRH14.

† Subject to further testing as required by COLTO. COLTO above uses only: Atterberg Limits (<0.425 mm fraction; not arithmetic mean), Nominal Max Size, Grading Curve, Coarse Sand Ratio, Grading Modulus, Strength (CBR), and Swell.

* Check that Max Size <= 2/3 of compacted layer thickness.

** Opinions and interpretations expressed herein are outside the scope of SANAS accreditation
Version 6.01 25 March 2024



LABORATORY:

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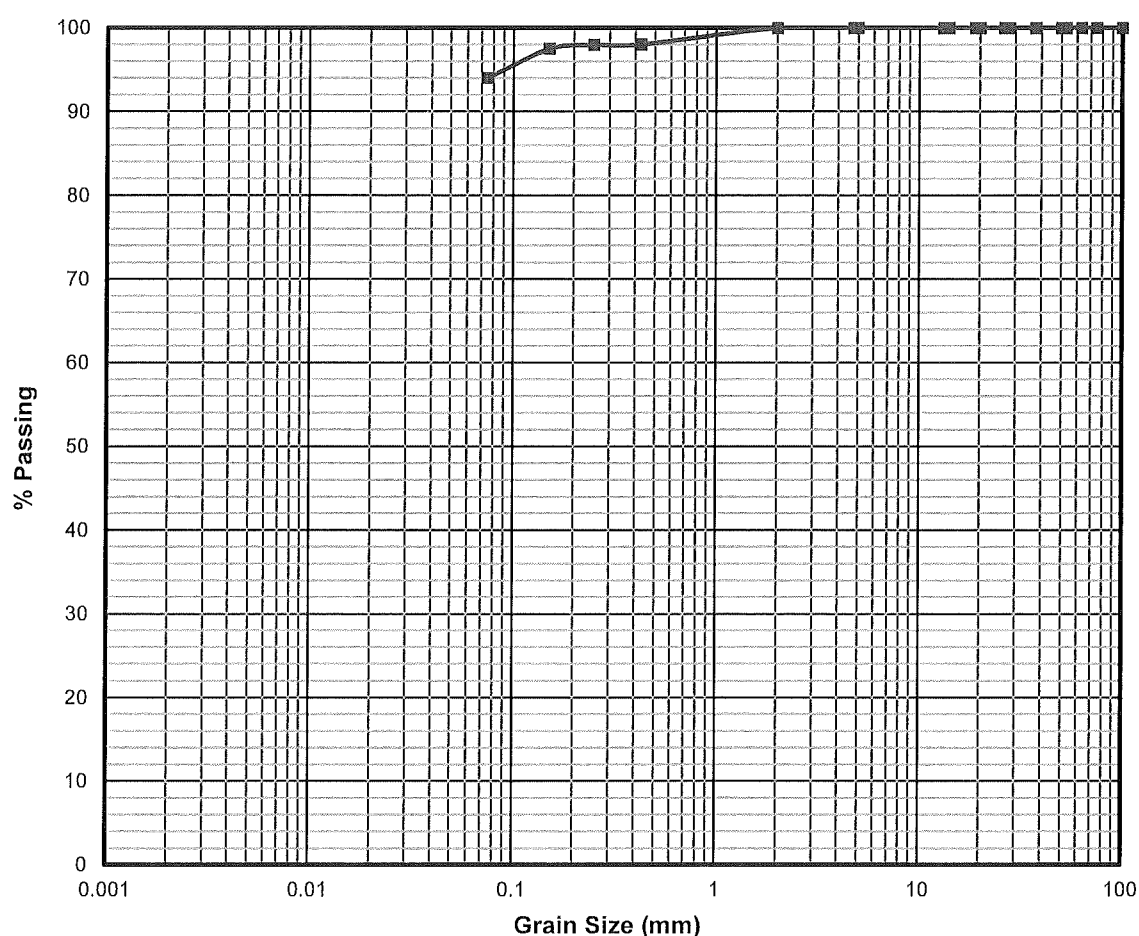
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 email: geosure@iafrica.com www.geosure.co.za

Client : ILZ Consulting (Pty) Ltd
 Project : Xesibe SSS
 Attention : Mr A.I. Mdalose

Your Ref No.: 26_056_Xesibe
 Our Ref No. : 101223
 Date Reported : 01/07/2026

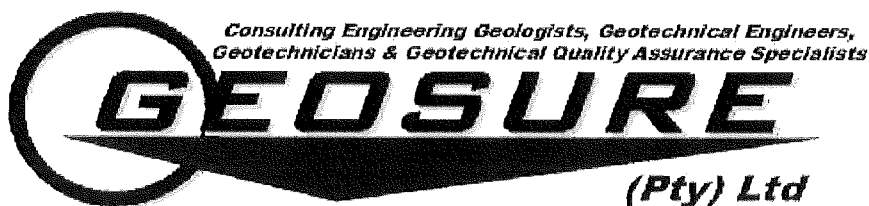
Grading Curve for Sample T61900 – SANS 3001



Clay	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse
	Silt			Sand			Gravel		

Thick Red Line is the Grading Curve (COLTO Classification = Cannot be Determined) (TRH 14 Classification = G10)

Sieve Aperture Size	0.075	0.150	0.250	0.425	2.00	4.75	5.00	13.20	14.00	19.00	20.00	26.50	28.0	37.5	50.0	53.0	63	75	100
Percentage Passing	94%	97%	98%	98%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%


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Client : ILZ Consulting (Pty) Ltd

Project : Xesibe SSS

Attention : Mr A.I. Mdlalose

Your Ref No. : 26_056_Xesibe SS

Our Ref No. : 101223

Date Reported : 23.06.2026

SANS 3001 Moisture/Density Relationship

Sample No. : T61900

Method of preparation : N/A

Natural/Stabilised : Natural

Material Description : Lt.Rd.Br.Or.Br.Clayey SILT. (Residual Mudstone)

Field No. : TP1

Depth (m) : 0.20-0.70

Origin : -

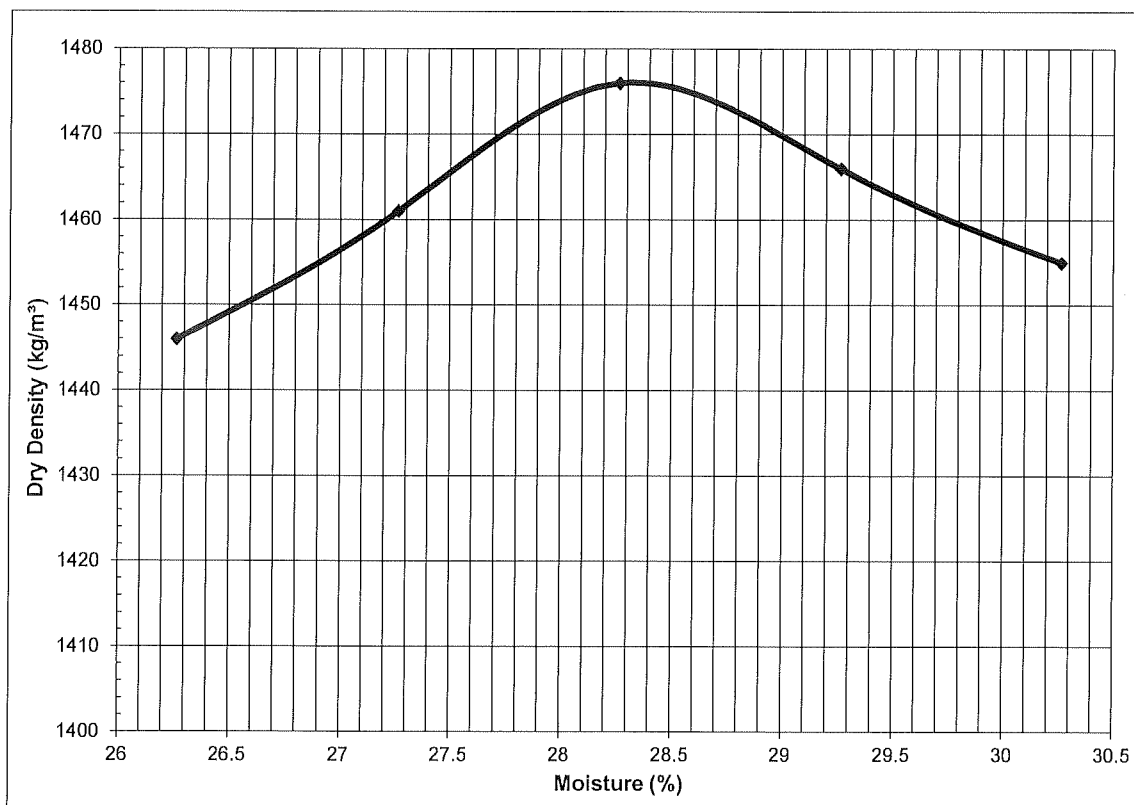
Compaction Effort : Mod AASHTO

Maximum Dry Density (kg/m³) 1476

Optimum Moisture Content (%) 28.4

Plotted Values:

Moisture (%)	26.3	27.3	28.3	29.3	30.3
Dry Density (kg/m ³)	1446	1461	1476	1466	1455



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APPENDIX A

UNCERTAINTY OF MEASUREMENT AND DECISION RULE

Notes on Uncertainty:

1. ABBREVIATIONS: UoM = Uncertainty of Measurement; E.UoM = Expanded Uncertainty of Measurement
2. UoM for gravels, sands, cohesive materials and asphalt was determined from a reproducibility study
2. UoM for aggregates and concrete was determined from a repeatability study

Notes on Decision Rule:

1. The decision rule employed by this laboratory is based on ILAC-G9:03/2009
2. Decision rules are only applicable to classification of gravels, sands and cohesive materials
3. Contact GEOSURE for further information related to the decision rule

MATERIAL TYPE		GRAVELS AND CRUSHED STONE (G1 - G5)	SANDS (G8-G9)	COHESIVE MATERIALS (G5 - G9)
PROPERTY		E.UoM (K=2)	E.UoM (K=2)	E.UoM (K=2)
% Passing Sieve Aperture	100.0 mm	0.00	0.00	0.00
	75.0 mm	0.00	0.00	2.56
	63.0 mm	0.00	0.00	1.48
	50.0 mm	0.00	0.00	1.56
	37.5 mm	0.36	0.00	1.32
	28.0 mm	2.08	0.00	0.98
	20.0 mm	0.78	0.00	0.98
	14.0 mm	0.38	0.00	1.82
	5.00 mm	1.94	0.44	1.10
	2.00 mm	2.44	0.56	0.90
	0.425 mm	1.42	1.40	1.42
	0.075 mm	0.38	0.72	0.98
Mechanical Analysis (%)	CS	1.32	1.08	0.98
	CFS	1.32	0.66	0.00
	MFS	0.00	1.56	0.00
	FFS	0.74	0.92	1.02
	S+C	1.36	0.36	0.00
Grading Modulus		0.04	0.02	0.06
Atterberg Limits (%)	LL	0.00	0.00	1.60
	PI	0.00	0.00	0.84
	LS	0.00	0.00	0.22
CBR (%)	100% Comp.	18.36	8.24	2.70
	98% Comp.	9.24	7.50	1.10
	97% Comp	5.84	6.82	0.62
	95% Comp	1.32	3.04	0.40
	93% Comp.	1.94	2.44	0.66
	90% Comp.	3.54	1.50	0.66
	Swell @ 100%	0.04	0.00	0.92
MOD	MDD (kg/m ³)	5.74	3.42	7.76
	O.M.C (%)	0.08	0.12	0.50
Atterberg Limits (%) GR11	LL	0.55		
	PI	0.57		
	LS	0.13		
Nuclear Density				
Property		E.UoM (K=2)		
Wet Density (kg/m ³)		8.88		
Dry Density (kg/m ³)		11.36		
Moisture Content (%)		0.38		

AGGREGATE (SINGLE SIZED CRUSHED STONE)		
PROPERTY		E.UoM (K=2)
% Passing Sieve Aperture	100.0 mm	0.00
	75.0 mm	0.00
	63.0 mm	0.00
	50.0 mm	0.00
	37.5 mm	0.00
	28.0 mm	0.00
	20.0 mm	0.16
	14.0 mm	0.14
	10.0 mm	0.32
	7.1 mm	0.18
	5.0 mm	0.20
	2.0 mm	0.08
	1.0 mm	0.18
	0.600 mm	0.20
	0.425 mm	0.20
	0.300 mm	0.16
	0.150 mm	0.04
	0.075 mm	0.12
Fineness Mod.		0.00
Flak. Index	%	0.22
ALD	mm	0.12
ALD Comp.	mm	0.10
Sand Equiv		0.54
ACV (AG10)	%	0.10
10% FACT(AG10)	kN	1.08
ACV (AG15)	%	0.00
10% FACT(AG15)	kN	1.00
BD (AG20)	kg/m ³	0.38
AD (AG20)	kg/m ³	0.44
WA (AG20)	%	0.00
BD (AG21)	kg/m ³	22.76
AG (AG21)	kg/m ³	27.04
WA (AG21)	%	0.00
ARD (AG22)	kg/m ³	1.92
RD (AG23)	kg/m ³	2.04
PD (AG23)	kg/m ³	0.00
Eth. Glyc. (AG14)	EGDI	0.8
Water Soluble Salts (5849)	%	0.05
Meth. Blue (6243)	%	0.04
PSV	Friction Value	0.1
EC (GR60)	s/m	0.002
pH	pH	0.199

ASPHALT		
PROPERTY		E.UoM (K=2)
% Passing Sieve Aperture	37.5 mm	0.00
	28.0 mm	0.00
	20.0 mm	0.00
	14.0 mm	0.13
	10.0 mm	0.46
	7.1 mm	1.53
	5.00 mm	1.31
	2.00 mm	1.08
	1.00 mm	0.76
	0.600 mm	0.53
	0.425 mm	0.51
	0.300 mm	0.48
	0.150 mm	0.36
	0.075 mm	0.41
Binder Cont.	%	0.15
Fineness Mod		0.04
BD	kg/m ³	4.22
Stability	kN	0.74
Flow	mm	0.09
MVD	kg/m ³	4.84

CONCRETE		
AGE		E.UoM (K=2)
7 Day Results		
Strength(MPa)		2.30
28 Day Results		
Strength(MPa)		1.26
Chloride Conductivity (ms/cm) C03-3		0.034
Porosity (%) C03-3		0.406
Oxygen Permeability (OPI)		0.068
Water Sorptivity UCT Manual Part 3 (0.5mm/hr)		0.218
Water Sorptivity - Porosity UCT Manual Part 3 (0.5mm/hr)		1.169
Alkali Reactivity (%)		0.002

