

Final Geotechnical Investigation Report for Jama Primary 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 Jama Primary 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 **Jama Primary 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

Jama Primary School is located in Pumzipika, a village approximately 62km southeast of Mbizana, under the Alfred Nzo District Municipality in the Eastern Cape Province, South Africa. Access is via R61 and Mtentu Beach Road from Bizana. (see **Figure 3-1**). The school has 4 classroom blocks, an admin block, a kitchen, and 1 existing toilet for learners and teachers.

The approximate central coordinates are -31.171830° Lat and 29.949392° Long. The coordinates are WGS84.

Topographically, the site is located on a relatively flat terrain with grass cover.



Figure 3-1: Locality Map relative to Mbizana.

4 FIELD WORK

Geotechnical site investigation was undertaken on the 09th 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. Refusal was encountered in DCP2 at 1.80m. 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 Natal Group (S?) quartzitic sandstone 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 residual sandstone 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 Residual Sandstone

This horizon was encountered throughout the site at depths ranging from surface to 1.70m. It was described as slightly moist to wet, whitish grey to light brown, very loose, intact, fine to medium grained, silty sand with scattered roots.

5.2 Groundwater Occurrence

No groundwater seepage was encountered. However, there was significant increase in moisture the residual sandstone.

Any cuttings that are taken below this horizon are likely to experience groundwater seepage problems during wet summer season, an allowance for subsoil drains may be necessary.

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

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 (%) Compaction MDD				Classification and Activity
		LL	PI	LS		MDD (kgm3)	OMC %	90	93	95	100	
TP1	0.00-1.50	NP	NP	0.0	1.03							A-2-4(0), LOW
TP1	0.00-1.50	NP	NP	0.0	1.03	2009	6.6	14	17	19	27	A-2-4(0), G7

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 = NP LS = 0.0 GM = 1.03 Classify as, A-2-4(0) and G7 in terms of TRH14. It has low heave potential.	Excellent to good subgrade quality. Can be used as a selected 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 sandstone ranges between 43kPa to 184kPa. Below 1.80m, where refusal was encountered, the EASBP was a maximum of 318kPa.

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 **S1**.

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	NEGLIGIBLE	-	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 residual sandstone. These silty sands have very loose consistencies and may be classified as **S1** according to NHBRC. Based on the penetrometer tests, the structures should therefore be placed on the silty sands 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.
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 which in DCP1 refused at 1.80m.

Table 8-3: Excavation classification

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

9 CONCLUSION

This final report contains the results of a geotechnical investigation carried out for the proposed new ablutions facilities at Jama Primary 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 G7 according to TRH14, thus it is suitable for use as selected layer.

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

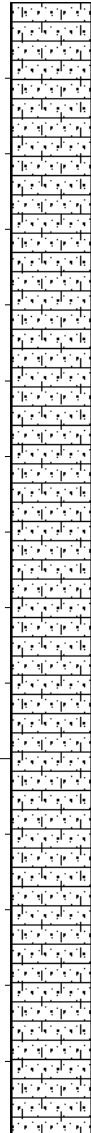
It is therefore quite possible that conditions at variance with those discussed above can be encountered elsewhere. It is advised that a competent person be called to advise on the way forward should conditions at variance be encountered.

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

0.00-1.50m
Scale
1:10



0.00

Slightly moist to wet, whitish grey to light brown, very loose, intact, fine to medium grained, silty sand. Residual sandstone.



1.50

NOTES

- 1) End of hole at 1.50m on residual sandstone.
- 2) No groundwater seepage.
- 3) No sidewall collapse.
- 4) MOD-CBR-ind sample at 0.00-1.50m.

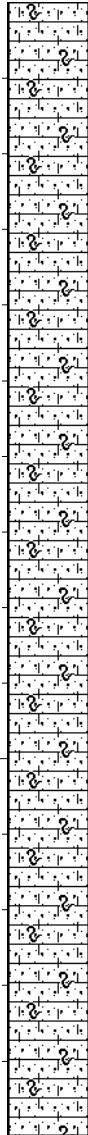
CONTRACTOR :
MACHINE : Pick and Shovel
DRILLED BY :
PROFILED BY : A Mdlalose
TYPE SET BY : A Mdlalose
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM :
DATE :
DATE : 09/06/2026
DATE : 01/07/2026 11:14
TEXT : ..gs\JamaPrimarySchool.txt

ELEVATION :
X-COORD : 29.949349°
Y-COORD : -31.171292°

HOLE No: TP1

Scale
 1:10



0.00

Slightly moist to moist, whitish grey to light brown, very loose, intact, fine to medium grained, silty sand with scattered roots. Residual sandstone.



1.50

NOTES

- 1) End of hole at 1.50m on residual sandstone.
- 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 : 09/06/2026
 DATE : 01/07/2026 11:14
 TEXT : ..gs\JamaPrimarySchool.txt

ELEVATION :
 X-COORD : 29.949713°
 Y-COORD : -31.171270°

HOLE No: TP2

JOB NUMBER: 26_056_Jama PS

Name ●

	SAND	{SA04}
	SILTY	{SA07}
	SANDSTONE	{SA11}
	DISTURBED SAMPLE	{SA38}
	ROOTS	{SA40}

CONTRACTOR :
 MACHINE :
 DRILLED BY :
 PROFILED BY :

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

INCLINATION :
 DIAM :
 DATE :
 DATE :

DATE : 01/07/2026 11:14
 TEXT : ..gs\JamaPrimarySchool.txt

ELEVATION :
 X-COORD :
 Y-COORD :

LEGEND
 SUMMARY OF SYMBOLS

APPENDIX B: PENETROMETER TEST RESULTS



APPROXIMATE INSITU CBR FROM DCP

Project Name Jama Primary School

Date 2026/06/09

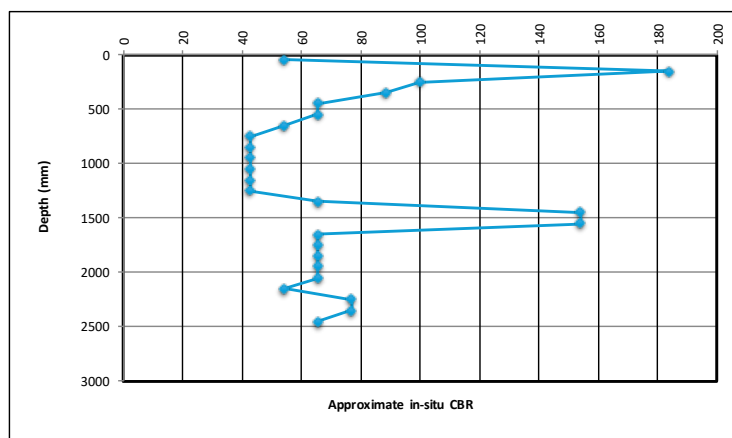
DCP No. 1

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 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	11	150	9	13	26	184
3	200	300	250	7	250	14	8	14	100
4	300	400	350	6	350	17	7	12	88
5	400	500	450	4	450	25	5	7	66
6	500	600	550	4	550	25	5	7	66
7	600	700	650	3	650	33	4	5	54
8	700	800	750	2	750	50	2	3	43
9	800	900	850	2	850	50	2	3	43
10	900	1000	950	2	950	50	2	3	43
11	1000	1100	1050	2	1050	50	2	3	43
12	1100	1200	1150	2	1150	50	2	3	43
13	1200	1300	1250	2	1250	50	2	3	43
14	1300	1400	1350	4	1350	25	5	7	66
15	1400	1500	1450	9	1450	11	11	20	154
16	1500	1600	1550	9	1550	11	11	20	154
17	1600	1700	1650	4	1650	25	5	110	66
18	1700	1800	1750	4	1750	25	5	7	66
19	1800	1900	1850	4	1850	25	5	7	66
20	1900	2000	1950	4	1950	25	5	7	66
21	2000	2100	2050	4	2050	25	5	7	66
22	2100	2200	2150	3	2150	33	4	5	54
23	2200	2300	2250	5	2250	20	6	9	77
24	2300	2400	2350	5	2350	20	6	9	77
38	2400	2500	2450	4	2450	25	5	7	66

APPROXIMATE INSITU CBR FROM DCP

Project Name Jama Primary School

Date 2026/06/09

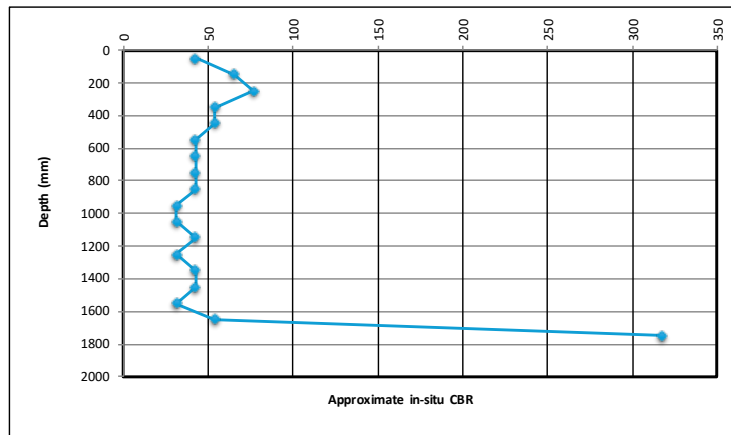
DCP No. 2

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	2	50	50	2	3	43
2	100	200	150	4	150	25	5	7	66
3	200	300	250	5	250	20	6	9	77
4	300	400	350	3	350	33	4	5	54
5	400	500	450	3	450	33	4	5	54
6	500	600	550	2	550	50	2	3	43
7	600	700	650	2	650	50	2	3	43
8	700	800	750	2	750	50	2	3	43
9	800	900	850	2	850	50	2	3	43
10	900	1000	950	1	950	100	1	0	31
11	1000	1100	1050	1	1050	100	1	0	31
12	1100	1200	1150	2	1150	50	2	3	43
13	1200	1300	1250	1	1250	100	1	0	31
14	1300	1400	1350	2	1350	50	2	3	43
15	1400	1500	1450	2	1450	50	2	3	43
16	1500	1600	1550	1	1550	100	1	0	31
17	1600	1700	1650	3	1650	33	4	110	54
18	1700	1800	1750	20	1750	5	24	56	318

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 : Jama PS

TEST REPORT REFERENCE NUMBER: 101230

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		SANS5833		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.

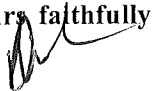
#De-notes non-accredited test method

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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Head Office 122 Intersite Avenue, Umgeni Business Park, Durban 4091, South Africa PO Box 1461, Westville, 3630, South Africa Tel.: +27 (0)861 GEOSURE / 0861 436 7873 Fax: +27 (0)86 689 5506 Mobile: +27 (0)82 784 0544 E-mail: geosure@iafrica.com	Civil Engineering Laboratory 122 Intersite Avenue, Umgeni Business Park, Durban, 4091, South Africa PO Box 1461, Westville, 3630, South Africa Tel: 031 701 9732 Fax: +27 (0) 86 684 9785 Mobile: 072 870 2621 E-mail: lab@geosure.co.za	Gauteng Branch P. O. Box 32381, Kyalami 1684 Tel.: 0861 GEOSURE / 0861 436 7873 Fax: 086 689 8327 Mobile: 083 377 6559 Email: gauteng@geosure.co.za
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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 9786
		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 6506
		Mobile: +27(0) 82 784 0544	e-mail: geosure@lafrica.com
WEBSITE:		www.geosure.co.za	

Client : ILZ Consulting (Pty) Ltd
 Project : Jama PS

Our Ref. : 101230

Your Ref. : 26_056

Date Tested : 22.06.2026 to 25.06.2026

Attention : Mr A.I. Mdlalose

Date Reported : 29.06.2026

Sample No.	T61905				
Field No.	TP1				
Position in Field	-				
Depth (m)	0.00-1.50				
Material Description	Light grey silty SAND (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	99			
	2.00 mm	99			
	0.425 mm	80			
	0.250 mm	47			
	0.150 mm	30			
	0.075 mm	18			

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

% Passing	0.060 mm	16			
	0.050 mm	15			
	0.040 mm	14			
	0.026 mm	13			
	0.015 mm	12			
	0.010 mm	11			
	0.0074 mm	10			
	0.0036 mm	7			
	0.0020 mm	6			
	0.0015 mm	4			

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

Coarse Sand	%	19			
Coarse Fine Sand	%	33			
Medium Fine Sand	%	17			
Fine Fine Sand	%	13			
Silt & Clay	%	18			
Grading Modulus		1.03			

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

Liquid Limit	%	NP			
Plasticity Index	%	NP			
Linear Shrinkage	%	0.0			
AASHTO Classification (Group Index)*		A-2-4 (0)			
Unified Classification*		SM			
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@iafrica.com
WEBSITE:	www.geosure.co.za

Client : ILZ Consulting (Pty) Ltd

Job No. : 101230

Project : Jama PS

Your Ref.No. : 26_056

Date Tested : 22.06.2026 to 25.06.2026

Attention : Mr A.I. Mdlalose

Date Reported : 29.06.2026

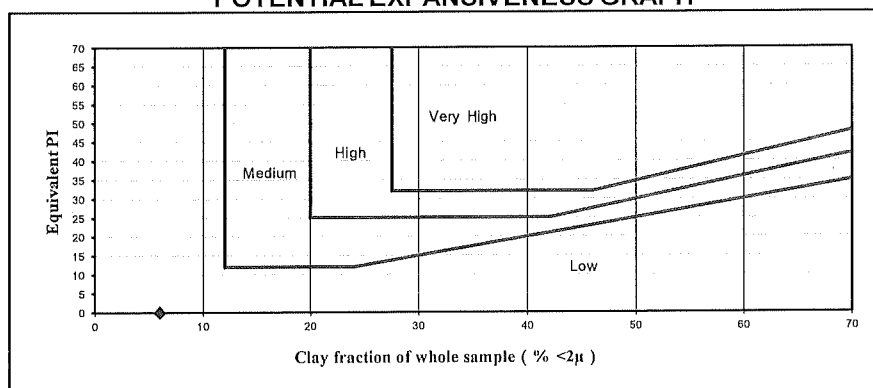
Sample Number : T61905

Field No. : TP1

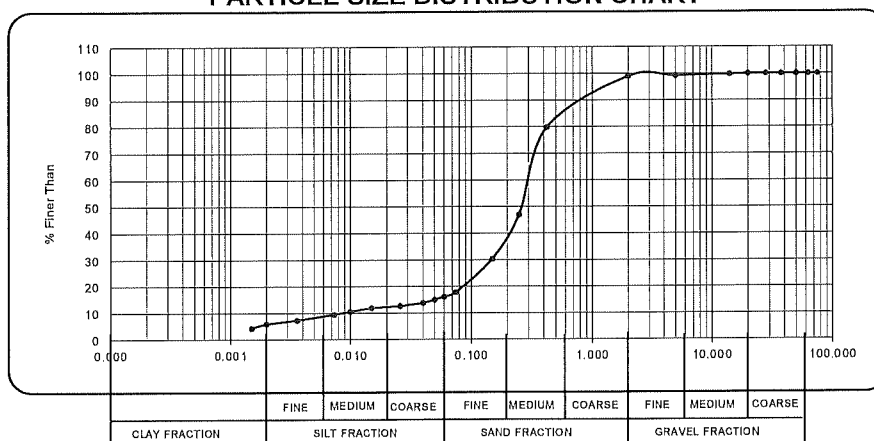
Sample Description : Light grey silty SAND (Residual Sandstone)

Equivalent PI : NP Clay fraction of whole sample (% <2 μ) : 6

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

Durban, 4091

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@iafrica.com www.geosure.co.za

Client : ILZ Consulting (Pty) Ltd
Project : jama PS
Attention : Mr A.I. Mdlosse

Your Ref No. : 26_056
Our Ref No. : 101230
Date Reported : 01/07/2026

Test Report - SANS 3001

Sample No.	T61903				
Field No.	TP1				
Position	-				
Depth (m)	0.00-1.50				
Method of Preparation	N/A				
Material Description	Light grey silty SAND (Residual Sandstone)				

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	100			
	5.00	99			
	4.750	99			
	2.000	99			
	0.425	80			
	0.075	18			
Grading Modulus		1.03			

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

Coarse Sand	2.000 - 0.425	19			
Coarse-Fine Sand	0.425 - 0.250	33			
Medium-Fine Sand	0.250 - 0.150	17			
Fine-Fine Sand	0.150 - 0.075	13			
Silt and Clay	< 0.075	18			

Atterberg Limits SANS 3001 on <0.425 mm fraction

Liquid Limit	% or symbol	NP			
Plasticity Index	% or symbol	NP			
Linear Shrinkage	%	0.0			

Maximum Dry Density and Optimum Moisture Content

Maximum Dry Density (kg/m³)	2009				
Optimum moisture content (%)	6.6				

California Bearing Ratio

CBR @100% Compaction	%	27			
CBR @ 98% Compaction	%	23			
CBR @ 97% Compaction	%	22			
CBR @ 95% Compaction	%	19			
CBR @ 93% Compaction	%	17			
CBR @ 90% Compaction	%	14			
Swell @100% Compaction	%	0.0			
COLTO Classification (1998)**		G7 (#)			
TRH 14 Classification (1985)**		G7			
AASHTO Classification (Group Index)**		A-2-4 (0)			
Unified Classification **		SM			

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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

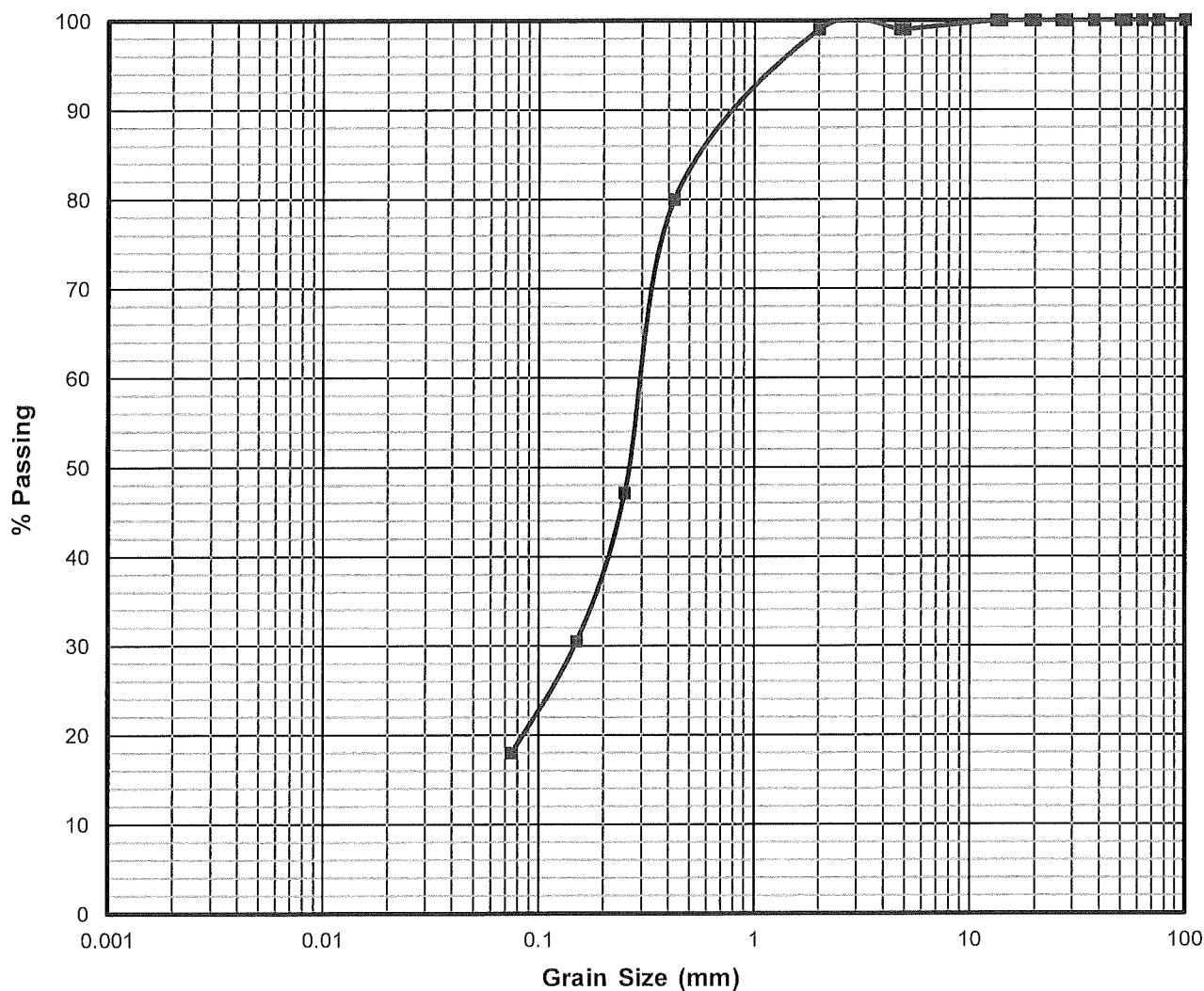
LABORATORY:
122 Intersite Avenue, Umgeni Business Park, Durban, 4091
P.O. Box 1461, Westville 3630
Mobile: +27(0)72 870 2621 Fax: 086 684 9785
Tel.: +27 (0)31 701 9732 email: lab@geosure.co.za

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@iafrica.com www.geosure.co.za

Client : ILZ Consulting (Pty) Ltd
Project : jama PS
Attention : Mr A.I. Mdlalose

Your Ref No.: 26_056
Our Ref No. : 101230
Date Reported : 01/07/2026

Grading Curve for Sample T61903 – SANS 3001



Thick Red Line is the Grading Curve (COLTO Classification = G7 (#)) (TRH 14 Classification = G7)

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	18%	30%	47%	80%	99%	99%	99%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

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@iafrica.com www.geosure.co.za

Client : ILZ Consulting (Pty) Ltd

Project : Jama PS

Attention : Mr A.I. Mdlalose

Your Ref No. : 26_056

Our Ref No. : 101230

Date Reported : 23.06.2026

SANS 3001 Moisture/Density Relationship

Sample No. : T61903

Method of preparation : N/A

Natural/Stabilised : Natural

Material Description : Lt.Gr.Silty SAND (Residual Sandstone)

Field No. : TP1

Depth (m) : 0.00-1.50

Origin : -

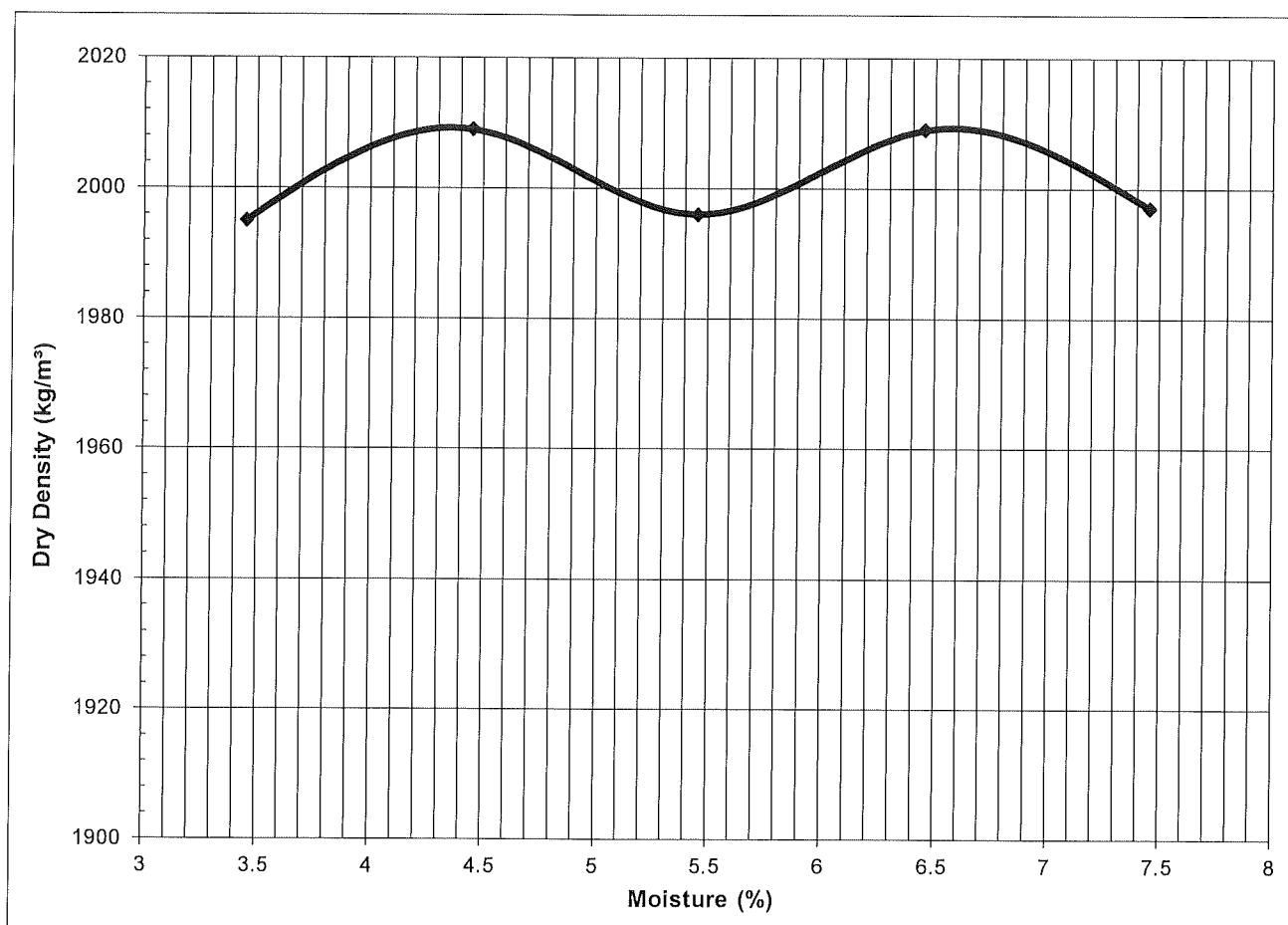
Compaction Effort : Mod AASHTO

Maximum Dry Density (kg/m³) : 2009

Optimum Moisture Content (%) : 6.6

Plotted Values:

Moisture (%)	3.5	4.5	5.5	6.5	7.5
Dry Density (kg/m ³)	1995	2009	1996	2009	1997



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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	0.64
	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

