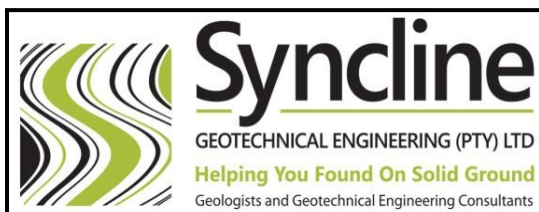




**REPORT TO TLS ENGINEERS AND PROJECT MANAGERS ON THE
RESULTS OF A GEOTECHNICAL MATERIALS INVESTIGATION FOR THE
PROPOSED REHABILITATION OF ROAD M89 IN WARD 18,
MSUNDUZI MUNICIPALITY**

REPORT REFERENCE: SGE-060-2020.REP01

Prepared By:



Prepared For:



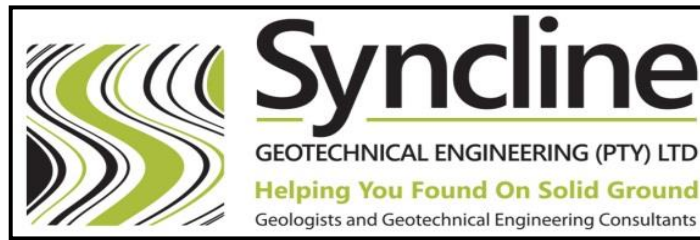
Author: S. Pather (Pr.Sci.Nat.) 400020/08 (South African Council for Natural Scientific Professions)

Date: 28 July 2020

Syncline Geotechnical Engineering (Pty) Ltd

Company Registration No. 2012/181469/07

Director: S. Pather Pr.Sci.Nat. (SACNASP), BSc (Hons), MSAIEG, FGSSA, MAEG, NHBRC Registered



KwaZulu-Natal Physical Address (Head Office):

**Unit 417, Mazars House
197 Peter Mokaba (North Ridge) Road
Morningside
Durban
4001**

Gauteng Branch Physical Address:

**26 Republic Road
Bordeaux
2196
Gauteng
South Africa**

Telephone No:	031-207 1383 011-781 4548
Fax No:	031-207 1349
Mobile No:	084-500 5095
Administration E-Mail:	admin@syncline.co.za
Director E-Mail:	sundras@syncline.co.za
Website:	www.synclinegeo.co.za

REPORT TO TLS ENGINEERS AND PROJECT MANAGERS ON THE RESULTS OF A GEOTECHNICAL MATERIALS INVESTIGATION FOR THE PROPOSED REHABILITATION OF ROAD M89 IN WARD 18, MSUNDUZI MUNICIPALITY

REPORT REFERENCE: SGE-060-2020.REP01

TABLE OF CONTENTS

1.	TERMS OF REFERENCE	1
2.	SCOPE OF REPORT	1
3.	INFORMATION UTILISED	1
4.	LIMITATIONS	1
5.	SITE DESCRIPTION	2
6.	FIELD INVESTIGATION.....	2
6.1	TEST PITS	2
6.2	CBR DYNAMIC CONE PENETROMETER (DCP) TESTS.....	3
6.3	LABORATORY TESTS	3
7.	RESULTS OF LABORATORY TESTS.....	3
8.	DISCUSSION.....	5
8.1	GENERAL STABILITY.....	5
8.2	SUBSOILS AND GEOLOGY	5
8.3	GROUNDWATER CONDITIONS	6
8.4	TRENCHABILITY ASSESSMENT	6
8.5	MATERIALS USAGE AND PROPOSED PAVEMENT DESIGN	6
8.6	POTENTIAL BORROW PITS AND COMMERCIAL SOURCE	7
8.7	DRAINAGE	7
8.8	FURTHER TESTING DURING CONSTRUCTION	8
9.	CONCLUSIONS	8
	Appendix A: Test Pit Log Profiles and Photos	
	Appendix B: Results of CBR Dynamic Cone Penetrometer (DCP) Tests	
	Appendix C: Results of Laboratory Tests	
	Figure 1: Site Plan (Road M89)	

REPORT TO TLS ENGINEERS AND PROJECT MANAGERS ON THE RESULTS OF A GEOTECHNICAL MATERIALS INVESTIGATION FOR THE PROPOSED REHABILITATION OF ROAD M89 IN WARD 18, MSUNDUZI MUNICIPALITY

1. TERMS OF REFERENCE

Syncline Geotechnical Engineering (Pty) Ltd (hereafter referred to as SGE) was requested by Lereesen Naidoo of TLS Engineers and Project Managers (on behalf of Msunduzi Municipality) to provide a proposal and cost estimate to conduct a geotechnical materials investigation for ***“THE UPGRADE OF ROADS IN MSUNDUZI - WARDS 7, 8 AND 18”***.

SGE completed and submitted the quotation document, and was subsequently formally appointed by TLS on 17 June 2020 to carry out the investigation (electronic mail received from Mr Naidoo).

2. SCOPE OF REPORT

This report sets out the results of a Geotechnical Materials Investigation for the ***“PROPOSED REHABILITATION OF ROAD M89 IN WARD 18, MSUNDUZI MUNICIPALITY”***.

The subgrade materials occurring along the road are classified and comment is made on stability and rippability/excavatability of the pavement subsoil materials. Recommendations are also provided for material use in the construction/rehabilitation of the road and pavement design.

3. INFORMATION UTILISED

For the purposes of assisting with this investigation TLS provided SGE with the following information:

- A KMZ/KML Google Earth file which shows the road alignment; and
- Drawing titled “Road Layout Plan” for Rehabilitation of Road M89 – Ward 18 (Drawing No. TLS19-05TP-C-DED-DWG-001).

SGE also made reference to the 250 000 Geological Map titled *“2930 Durban”* as published by the Geological Survey.

4. LIMITATIONS

The nature of Geotechnical Engineering is such that variations in soil conditions may occur even where sites seem to be consistent. Variations in what is reported here may become evident during construction and it is thus imperative that a

Competent Person inspects all excavations to ensure that conditions at variance with those predicted do not occur and to undertake an interpretation of the facts supplied in this report.

5. SITE DESCRIPTION

The study area is situated in Ward 18 Msunduzi Municipality, approximately 10km south of Pietermaritzburg CBD. The road is located as follows:

Table 1: Location of Road M89 in Ward 18

Road Name	Start Position		End Position		Length (km)
	Latitude (S)	Longitude (E)	Latitude (S)	Longitude (E)	
M89	29° 40'47.67"	30° 22'28.61"	29° 41'0.81"	30° 22'34.63"	0.84

Plates 1 and 2 below provide general views of the road.

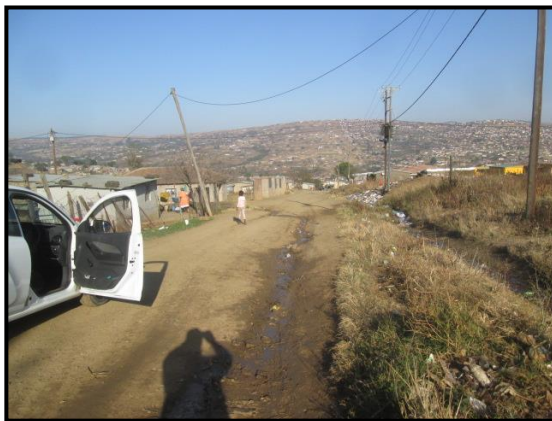


Plate 1



Plate 2

Plates 1 and 2: General views of Road M89

6. FIELD INVESTIGATION

The fieldwork for the investigation was conducted in June 2020 and comprised the following:

- Test Pits;
- CBR Dynamic Cone Penetrometer (DCP) tests, and
- Soil Sampling.

6.1 Test Pits

Three (3No.) Test Pits, designated TP1 through TP3, were excavated by hand at the approximate positions indicated in Figure 1.

The test pits were extended to a final depth of 1.0 metre below existing ground level (EGL) or up to bedrock refusal, and profiled using the “Guidelines for Soil and Rock Logging in South Africa”, (2001)¹.

Copies of the detailed log profiles are given in Appendix A.

6.2 CBR Dynamic Cone Penetrometer (DCP) Tests

Three (3No.) CBR Dynamic Cone Penetrometer (DCP) tests, designated DCP1 to DCP3, were carried out at the approximate positions indicated in Figure 1. The DCP tests were advanced to a final depth of 1.0 below EGL or equipment refusal.

The results of the DCP tests comprising plots of blow counts versus depth are given in Appendix B.

6.3 Laboratory Tests

Disturbed soil samples were retrieved from the test pits and sent to ROADLAB laboratory for the following tests:

- Particle Size Distribution/Grading;
- Atterberg Limits;
- Modified AASHTO; and
- California Bearing Ratio (CBR) tests.

In addition to the above, laboratory tests results of crushed aggregate samples were also received from **Taylor's Halt Quarry** (testing carried out by SOILCO laboratory).

The results of the laboratory tests are summarised in Section 7 of this report and given in Appendix C.

7. RESULTS OF LABORATORY TESTS

The results of the laboratory tests are summarised in Table 2 below.

¹ AEG, SAICE and SAIEG. “Guidelines for Soil and Rock Logging in South Africa”. Editors, A. B. A. Brink and R. M. H. Bruin; Proceedings, Geoterminology Workshop, Johannesburg 2001.

Table 2: Summary of results of Particle Size Distribution Analysis, Atterberg Limit Determinations, Modified AASHTO and CBR tests

TP No.	Depth (m)	Description	Particle Size % (ASTM)			*Atterberg Limits %			GM	OMC (%)	MDD (kg/m³)	Natural Moisture Content %	% Swell MOD	CBR (%)						HRB and TRH14 (1985) Classification	Subgrade Suitability
			Clay + Silt	Sand	Gravel	LL	PI	LS						90	93	95	97	98	100		
WEARING COURSE																					
TP2	0.00 – 0.15	Grey, sandy GRAVEL	15	20	65	31	10	5.0	2.3	7.2	2203	-	0.05	12	16	20	24	26	32	A-2-4(0) G7	Very Good
SUBGRADE FILL																					
TP1	0.15 – 0.50	Moderate brown, gravelly, clayey, silty SAND	50	17	33	58	28	13.5	1.2	7.8	2052	-	0.02	5	9	12	17	20	27	A-7-5(11) G10	Fair
SUBGRADE INSITU																					
TP3	0.50 – 0.90	Reddish brown, silty CLAY	90	10	0	54	15	5.0	0.10	19.0	1631	-	0.03	2	3	4	5	6	7	A-7-5(13) NA	Poor
SAMPLES FROM TAYLORS HALT QUARRY																					
P10401	-	Grey/blue, crushed dolerite bedrock	6	24	70	0	NP	0.0	2.49	4.6	2410	-	0.02	40	54	66	-	90	110	A-1-a(0) G2	Excellent
P10402	-	Grey/blue, crushed dolerite bedrock	4	16	8	0	NP	0.0	2.66	3.2	2435	-	0.01	48	55	61	-	71	79	A-1-a(0) G5	Excellent

LL - Liquid Limit
PI - Plasticity Index
NP - Non Plastic
MDD - Maximum Dry Density

OMC - Optimum Moisture Content
LS - Linear Shrinkage
CBD - Could Not Be Determined
CBR - California Bearing Ratio

G9 - TRH14 Classification
GM - Grading Modulus
A-2-4 – Highway Research Board (HRB) Classification

8. DISCUSSION

8.1 General Stability

It is considered that the site is stable and suitable for development provided that the recommendations given in this report are adhered to.

No signs of inherent ground instability such as slip scars, tension cracks or sloughing of the mantle of soils were evident during the fieldwork.

8.2 Subsoils and Geology

The geology along the gravel road is generally characterised by a gravel wearing course layer, subgrade fill gravelly sand layer, insitu (natural) clayey soils and completely to highly weathered dolerite bedrock at depth.

The following subsoil horizons can be recognised along the gravel road:

- Slightly moist, grey to yellowish grey, medium dense to dense, uniform, sandy GRAVEL - **WEARING COURSE**.
- Slightly moist, moderate brown to greyish brown, medium dense, uniform gravelly, moderately clayey, silty SAND - **SUBGRADE FILL**.
- Slightly moist, moderate brown to reddish brown, soft to firm, intact, uniform, silty CLAY - **SUBGRADE INSITU**.
- Yellowish brown, stained orange, completely to highly weathered, medium to coarse grained, highly fractured, extremely soft to very soft rock - **DECOMPOSED DOLERITE - SUBGRADE INSITU**.

Plates 3 and 4 below provide an indication of the typical subsoil layers encountered along the gravel road.



Plate 3: TP3



Plate 4: Spoil from TP3

Plates 3 and 4: Typical subsoil layers encountered along the road

8.3 Groundwater Conditions

Groundwater seepage was not encountered along the gravel road and the water table is anticipated to occur at a depth in excess of 3.0 metres below EGL.

8.4 Trenchability Assessment

Generally the subsoils can be easily excavated up to a depth of at least 1.0 metre using conventional light earthmoving equipment, and will classify as SOFT and INTERMEDIATE excavation in terms of SANS 1200D.

Consideration should be given to using the following percentages for classification of excavations:

Soft Excavation	80%
Intermediate	20%

8.5 Materials Usage and Proposed Pavement Design

The general assessment of subsoil materials for use in the road construction has been based on field and laboratory tests.

The characteristics of the materials and their suitability for use in construction is summarised in Table 3 below.

Table 3: Materials classification and usage

Material Type	Description	TRH14 Classification
WEARING COURSE	Grey, sandy GRAVEL	Very good subgrade material (G7).
SUBGRADE FILL	Moderate brown, gravelly, clayey, silty SAND	Fair subgrade material (G10).
SUBGRADE INSITU	Reddish brown, silty CLAY	Poor subgrade material (Worse than G10).
SUBGRADE INSITU	Yellowish/orange brown, extremely soft to very soft rock	Not tested, but anticipated very good subgrade material (G7 – G8).

It is understood that the proposed road design will comprise the following pavement layers (information received from TLS):

Road M89

- 40mm AC MEDIUM MIX COMPACTED TO 96% MARSHAL DENSITY.
- 125mm G2 MATERIAL FROM COMMERCIAL SOURCE COMPACTED TO 100% MOD. ASSHTO.
- 150mm G5 MATERIAL FROM COMMERCIAL SOURCE COMPACTED TO 95% MOD. AASHTO.
- RIP & COMPACT TO 300mm IN-SITU MATERIAL TO 93% MOD. ASSHTO in 150mm LAYERS - MATERIAL WITH CBR=15% (G7) TO BE IMPORTED FROM STOCK PILE OR COMMERCIAL SOURCE AND USED TO SUPPLEMENT IN AREAS WITH LOCALISED POOR SUBGRADE.

Regarding the above, the reddish brown silty clay in-situ materials at formation level are considered poor subgrade. However, decomposed dolerite in-situ subgrade is anticipated to classify as G7 – G8 according to TRH14 (but additional laboratory testing will be required to confirm this during construction).

8.6 Potential Borrow Pits and Commercial Source

A search for potential borrow pits in the vicinity of the study area proved to be unsuccessful. However, a wide range of materials (G2, G5, Crusher Run, Concrete Stone etc.) can be obtained from the nearby **Wearne Aggregates Quarry** or **Taylor's Halt Quarry** (commercial sources).

Wearne is located approximately 5km northwest of the study area at coordinates 29°40' 6.0"S - 30° 20' 36.4"E. Taylor's Halt is located approximately 25km west of the study area at coordinates 29°40' 9.1"S - 30° 11' 14.5"E.

Contact: Mr Mohamed Ally (Wearne Sales Executive)
Tel No: (011) 459 4500
Mobile No: 082 903 3499
Email: info@wearne.co.za

Contact: Mr Chris Aylward (Midmar Group Sales)
Tel No: (033) 320 1143
Mobile No: 076 053 5603
Email: sales@midmargroup.co.za

8.7 Drainage

On all road curves, the outer shoulder should be lined with upright kerbs to deflect water run-off back into the road stormwater system. Experience with the erodible soils indicates that unlined dish (half round) drains adjacent to the road are virtually ineffective and will soon give way to the formation of erosion gullies and scouring. Subsequent damage of road prism can be expected. The need for subsoil drainage will have to be assessed on site during construction.

8.8 Further Testing During Construction

Regular process control and acceptance control testing must be carried out during road construction. It is recommended that once the roadbed (formation) has been prepared that a series of samples be taken for CBR testing and stabilised tests (if required) at intervals as recommended in TMH5.

9. CONCLUSIONS

This report sets out the results of a Geotechnical Materials Investigation for the **“PROPOSED REHABILITATION OF ROAD M89 IN WARD 18, MSUNDUZI MUNICIPALITY”**.

The geology along the gravel road is generally characterised by a gravel wearing course layer, subgrade fill gravelly sand layer, insitu (natural) clayey soils and completely to highly weathered dolerite bedrock at depth.

Groundwater seepage was not encountered along the gravel road and the water table is anticipated to occur at a depth in excess of 3.0 metres below EGL.

It is considered that the site is stable and suitable for development provided that the recommendations given in this report are adhered to.

Generally the subsoils can be easily excavated up to a depth of at least 1.0 metre using conventional light earthmoving equipment, and will classify as SOFT and INTERMEDIATE excavation in terms of SANS 1200D.

The reddish brown silty clay in-situ materials at formation level are considered poor subgrade. However, decomposed dolerite in-situ subgrade is anticipated to classify as G7 – G8 according to TRH14 (but additional laboratory testing will be required to confirm this during construction).

A wide range of materials (G2, G5, Crusher Run, Concrete Stone etc.) can be obtained from the nearby **Wearne Aggregates Quarry** or **Taylor's Halt Quarry** (commercial sources).

Wearne is located approximately 5km northwest of the study area at coordinates 29°40' 6.0"S - 30° 20' 36.4"E. Taylor's Halt is located approximately 25km west of the study area at coordinates 29°40' 9.1"S - 30° 11' 14.5"E.

On all road curves, the outer shoulder should be lined with upright kerbs to deflect water run-off back into the road stormwater system.

Regular process control and acceptance control testing must be carried out during road construction. It is recommended that once the roadbed (formation) has been prepared that a series of samples be taken for CBR testing and stabilised tests (if required) at intervals as recommended in TMH5.

The ground conditions given in this report refer specifically to the field tests carried out on site. It is therefore, quite possible that conditions at variance with those given in this report can be encountered elsewhere on site during construction. It is therefore important that Syncline Geotechnical Engineering (Pty) Ltd be appointed to carry out periodic inspections during construction. Any change from the anticipated ground conditions could then be taken into account to avoid unnecessary expense.



Author: S. Pather (Pr.Sci.Nat.)

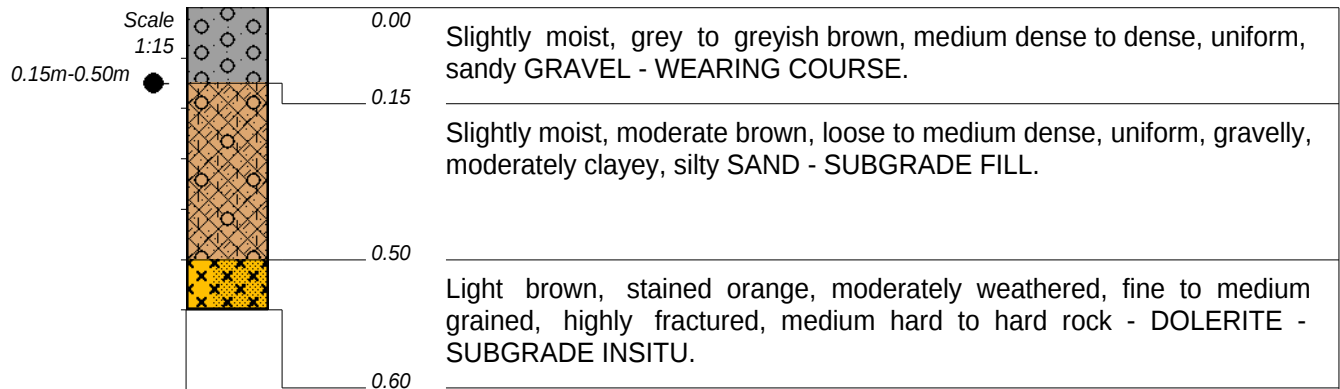
28 July 2020

Date

APPENDIX A

July 28, 2020

TEST PIT LOG PROFILES AND PHOTOS



NOTES

- 1) Depth of water table: Not encountered.
- 2) Sample taken at:
 S1 0.15m-0.50m (2 x Bulk).
- 3) Refusal depth at 0.60m.

CONTRACTOR :
 MACHINE : by hand
 DRILLED BY :
 PROFILED BY : Y. Hansa
 TYPE SET BY : K. Govender
 SETUP FILE : STANDARD.SET

INCLINATION :
 DIAM :
 DATE : 22 June 2020
 DATE : 22 June 2020
 DATE : 30/07/2020 10:13
 TEXT : C:\PERFLOGS\PITS1.TXT

ELEVATION :
 X-COORD : 29° 40' 49.3" S
 Y-COORD : 30° 22' 25.8" E

HOLE No: TP 1

GEOTECHNICAL INVESTIGATION

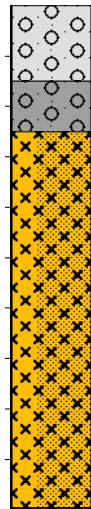
WARD 18 ROAD - MSUNDUZI MUNICIPALITY

TP1	
Latitude	S29° 40' 49.3"
Longitude	E30° 22' 25.8"



0.00m-0.15m

Scale
1:15



0.00

Slightly moist, light grey, medium dense to dense, uniform, sandy GRAVEL - WEARING COURSE.

0.15

Slightly moist, grey to greyish brown, medium dense to dense, uniform, sandy GRAVEL - OLD WEARING COURSE.

0.25

Yellowish brown, stained orange, completely to highly weathered, medium to coarse grained, highly fractured, extremely soft to very soft rock - DECOMPOSED DOLERITE - SUBGRADE INSITU.

1.00

NOTES

- 1) Depth of water table: Not encountered.
- 2) Sample taken at:
 S1 0.00m-0.15m (2 x Bulk).
- 3) Final depth at 1.00m.

CONTRACTOR :
 MACHINE : by hand
 DRILLED BY :
 PROFILED BY : Y. Hansa
 TYPE SET BY : K. Govender
 SETUP FILE : STANDARD.SET

INCLINATION :
 DIAM :
 DATE : 22 June 2020
 DATE : 22 June 2020
 DATE : 30/07/2020 10:13
 TEXT : C:\PERFLOGS\PITS1.TXT

ELEVATION :
 X-COORD : 29° 40' 57.9" S
 Y-COORD : 30° 22' 24.8" E

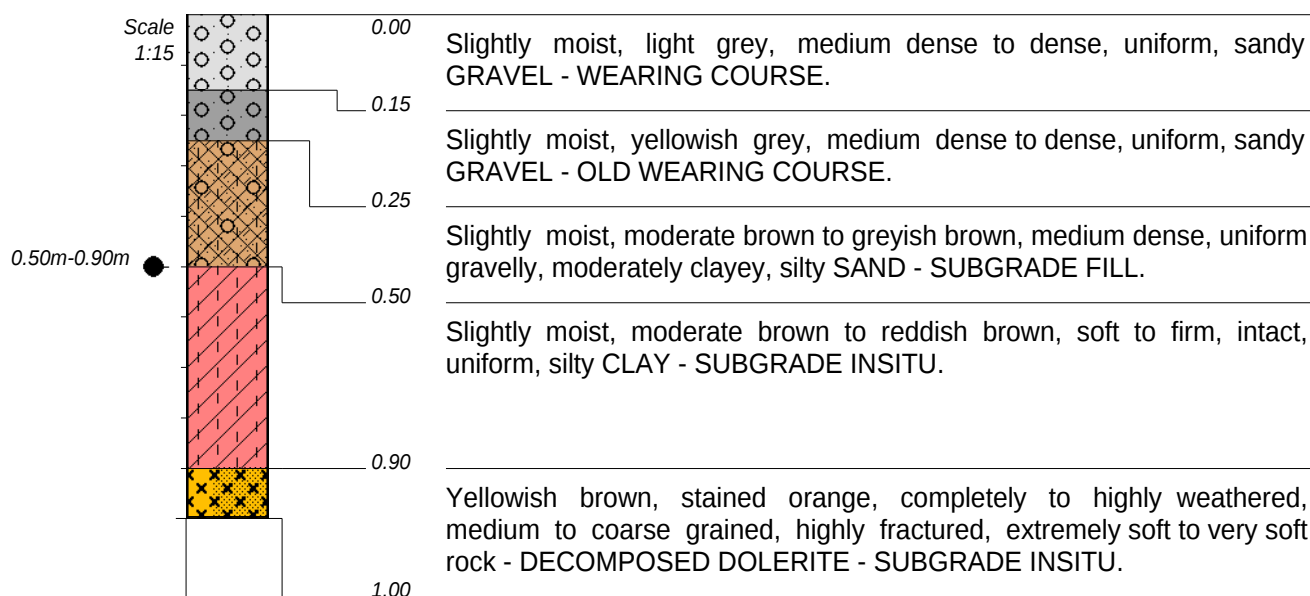
HOLE No: TP 2

GEOTECHNICAL INVESTIGATION

WARD 18 ROAD - MSUNDUZI MUNICIPALITY

TP2	
Latitude	S29° 40' 57.9"
Longitude	E30° 22' 24.8"





NOTES

- 1) Depth of water table: Not encountered.
- 2) Sample taken at:
 S1 0.50m-0.90m (2 x Bulk).
- 3) Final depth at 1.00m.

CONTRACTOR :
 MACHINE : by hand
 DRILLED BY :
 PROFILED BY : Y. Hansa
 TYPE SET BY : K. Govender
 SETUP FILE : STANDARD.SET

INCLINATION :
 DIAM :
 DATE : 22 June 2020
 DATE : 22 June 2020
 DATE : 30/07/2020 10:13
 TEXT : C:\PERFLOGS\PIPS1.TXT

ELEVATION :
 X-COORD : 29° 41' 02.3" S
 Y-COORD : 30° 22' 31.2" E

HOLE No: TP 3

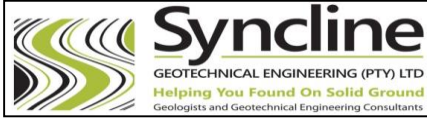
GEOTECHNICAL INVESTIGATION

WARD 18 ROAD - MSUNDUZI MUNICIPALITY

TP3	
Latitude	S29° 41' 02.3"
Longitude	E30° 22' 31.2"



RESULTS OF CBR DYNAMIC CONE PENETROMETER (DCP) TESTS



Dynamic Cone Penetration Test

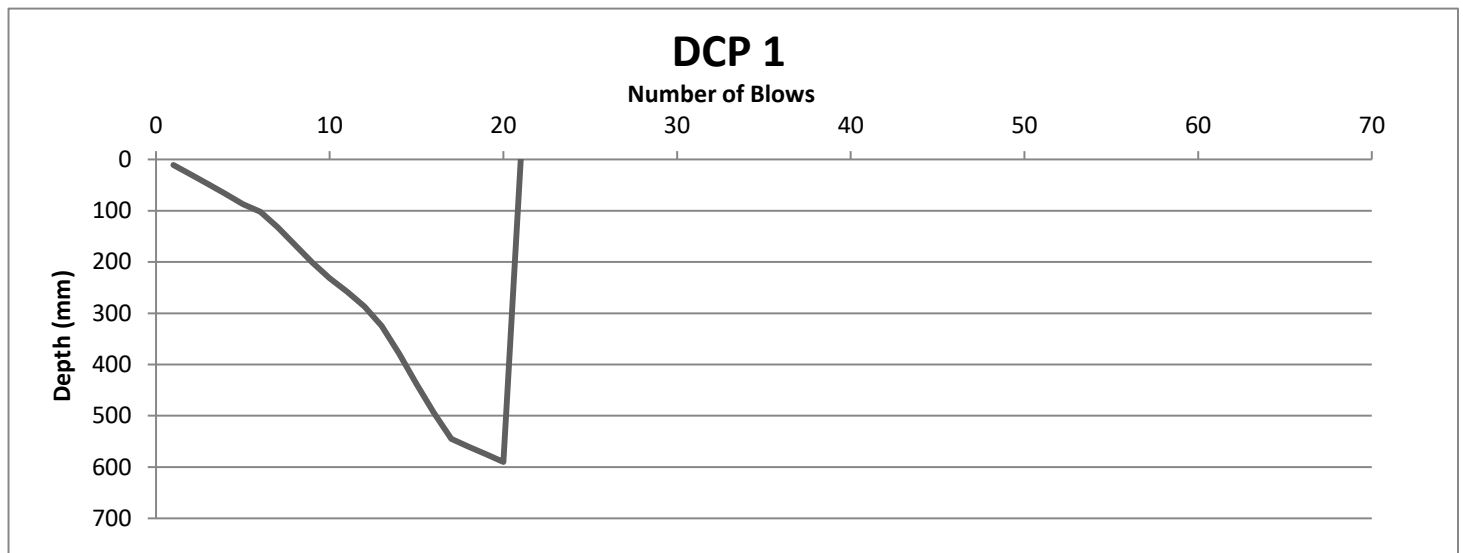
Client	: TLS Engineers & Project Managers	Reference No.	: SGE-060-2020
Project	: Ward 18 Road - Msunduzi Municipality	DCP No.	: 1
Operator	: Mr Y. Hansa	Latitude	: S29° 40' 49,3"
Date Tested	: 22 June 2020	Longitude	: E30° 22' 25,8"

No. of Blows	Instrument Reading	Depth in mm	mm per blow	CBR % Value	UCS kPa
0	11	0	0,0	0,0	0
5	29	18	3,6	80,6	287
10	48	37	3,8	75,2	271
15	67	56	3,8	75,2	271
20	87	76	4,0	70,5	256
25	102	91	3,0	101,6	348
30	132	121	6,0	42,1	167
35	167	156	7,0	34,6	141
40	201	190	6,8	35,9	146
45	232	221	6,2	40,4	161
50	258	247	5,2	50,5	194
55	287	276	5,8	44,0	173
60	325	314	7,6	31,2	130
65	379	368	10,8	20,0	89
70	438	427	11,8	17,8	81
75	495	484	11,4	18,6	84
80	545	534	10,0	22,0	97
85	560	549	3,0	101,6	348
90	575	564	3,0	101,6	348
95	590	579	3,0	101,6	348

Refusal

Dynamic Cone Penetration Test

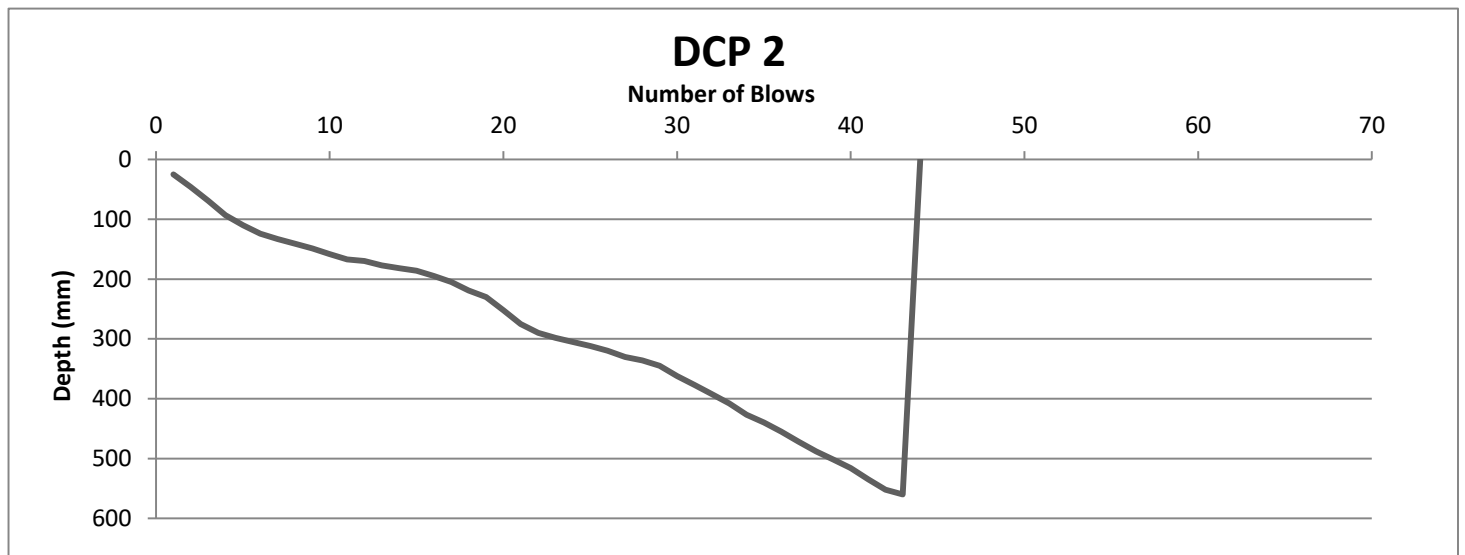
Client	: TLS Engineers & Project Managers	Reference No.	: SGE-060-2020
Project	: Ward 18 Road - Msunduzi Municipality	DCP No.	: 1
Logged by	: Mr Y. Hansa	Latitude	: S29° 40' 49,3"
Date Tested	: 22 June 2020	Longitude	: E30° 22' 25,8"

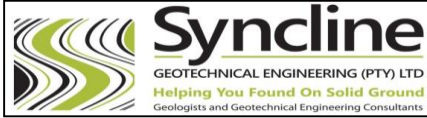


[illegible]

Dynamic Cone Penetration Test

Client	: TLS Engineers & Project Managers	Reference No.	: SGE-060-2020
Project	: Ward 18 Road - Msunduzi Municipality	DCP No.	: 2
Logged by	: Mr Y. Hansa	Latitude	: S29° 40' 57,9"
Date Tested	: 22 June 2020	Longitude	: E30° 22' 24,8"





Dynamic Cone Penetration Test

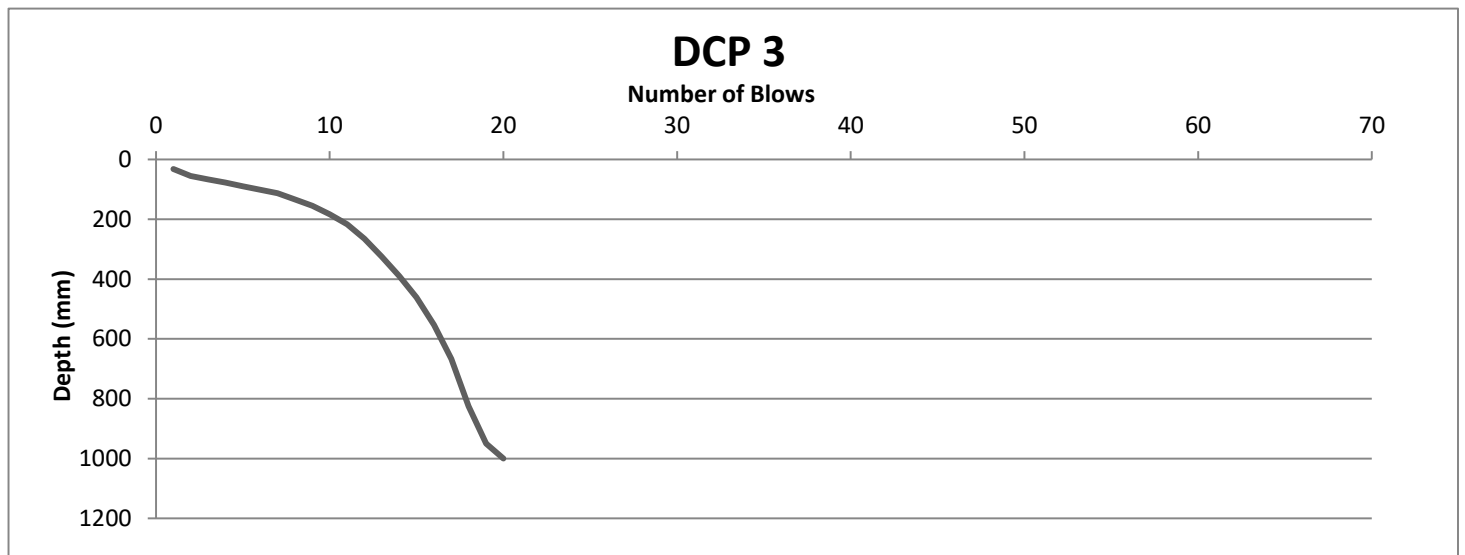
Client	: TLS Engineers & Project Managers	Reference No.	: SGE-060-2020
Project	: Ward 18 Road - Msunduzi Municipality	DCP No.	: 3
Operator	: Mr Y. Hansa	Latitude	: S29° 41' 02,3"
Date Tested	: 22 June 2020	Longitude	: E30° 22' 31,2"

No. of Blows	Instrument Reading	Depth in mm	mm per blow	CBR % Value	UCS kPa
0	32	0	0,0	0,0	0
5	55	23	4,6	59,0	221
10	67	35	2,4	134,9	441
15	77	45	2,0	170,0	535
20	90	58	2,6	121,8	405
25	101	69	2,2	150,6	483
30	113	81	2,4	134,9	441
35	134	102	4,2	66,3	243
40	155	123	4,2	66,3	243
45	183	151	5,6	46,0	179
50	217	185	6,8	35,9	146
55	265	233	9,6	23,2	101
60	325	293	12,0	17,5	80
65	390	358	13,0	15,8	73
70	461	429	14,2	14,1	67
75	553	521	18,4	10,1	51
80	667	635	22,8	7,7	40
85	825	793	31,6	5,1	29
90	950	918	25,0	6,9	37
95	1000	968	10,0	22,0	97

[illegible]

Dynamic Cone Penetration Test

Client	: TLS Engineers & Project Managers	Reference No.	: SGE-060-2020
Project	: Ward 18 Road - Msunduzi Municipality	DCP No.	: 3
Logged by	: Mr Y. Hansa	Latitude	: S29° 41' 02,3"
Date Tested	: 22 June 2020	Longitude	: E30° 22' 31,2"



RESULTS OF LABORATORY TESTS

**Roadlab KZN (Pty) Ltd**

Civil Materials
Testing
Registration No:
2012/080975/07
VAT No:
4870266444

+27 32 944 5977
jay@roadlab.co.za
Unit 6 24 Edmund
Morewood Street,
Tugela, Durban,
4399

material
Passion.
trusted
Accuracy.
timeous
Excellence.



T0806

Client:	Syncline Geotechnical Eng.(Pty) Ltd	Date Sampled:	N/A
Address:	197 Peter Mokaba Road, Morningside, 4001	Date Received:	25/06/20
		Date Tested:	29/06/20-06/07/20
Attention:	Mr S Pather	Date Reported:	07/07/20
Project:	Ward 18 Msunduzi	Clients Reference No:	N/A
		Order No:	SGE-060-2020

TEST REPORT REFERENCE NUMBER: RD 2662/20

Dear Sir,

Enclosed herewith please find test reports(s) pertaining to the above-mentioned project. All tests were in accordance with the prescribed test method(s). Information herein consists of the following:

Material Classification

Test Carried Out / Test Method					
SANS 3001 – GR 1	X	SANS 3001 – GR 50		SANS 3001 – AG 10	
SANS 3001 – GR 10	X	SANS 3001 – GR 51		SANS 3001 – AG 22	
SANS 3001 – GR 11	X	SANS 3001 – GR 53		SANS 3001 – AS 1	
SANS 3001 – GR 12		SANS 3001 – GR 54		SANS 3001 – AS 2	
SANS 3001 – GR 20	X	SANS 3001 – NG 5		SANS 3001 – AS 10	
SANS 3001 – GR 30	X	SANS 3001 – AG 1		SANS 3001 – AS 11	
SANS 3001 – GR 40	X	SANS 3001 – AG 2		SANS 3001 – AS 20	
SANS 3001 – GR 31		SANS 3001 – AG 4			
X - Symbol denotes tests that were carried out & are Accredited			Total number of pages in this Report:		5

Sample Information		Field Technician / Tested By
Sampler(s) Name:	Client	
Sampling Environmental Condition:	N/A	
NB: Sample Location and Test Positions Identified by Client		

TMH 5 (1981) - Sampling Method					
MA2		MB1		MC1	
				MC2	
					MB7

TMH 5 (1981) - Sample Preparation			
MD1	X	MD2	X

We would like to take this opportunity to thank you for your continuous support. Should you have any further queries please do not hesitate to contact me.

Yours faithfully

Technical Signatory: Mr J. Sarjooparsad

This report may not be reproduced in full, without written permission from Roadlab KZN (PTY) LTD. Whilst every care is taken to ensure the correctness of all tests and reports, Roadlab KZN (PTY) LTD. shall not be liable in any way for any error made in the reporting of test results. This report relates only to the sample/s tested.

Job Request No.: RD2662/20

Date Reported : 07/07/2020

Syncline Geotechnical Eng.(Pty) Ltd

197 Peter Mokaba Road

Morningside

4001

Project : Ward 18 Msunduzi

Attention : Mr S Pather

Material Classification

SAMPLE INFORMATION AND PROPERTIES

SAMPLE NO.	D 5756	D 5758	D 5757
HOLE NO./ Km / CHAINAGE	TP 1	TP 3	TP 2
ROAD NO./ NAME Line 1 ROAD NO./ NAME Line 2	N/A	N/A	N/A
LAYER TESTED/SAMPLED	Subgrade Fill	Subgrade Insitu	Wearing Course
SAMPLE DEPTH	0.15-0.50	0.50-0.90	0.00-0.15
DATE SAMPLED	25/06/2020	25/06/2020	25/06/2020
COLOUR OF SAMPLE	Moderate Brown	Silty Sandy Clay	Light Grey
TYPE OF SAMPLE	Sandy Gravel	Reddish Brown	Sandy Gravel

SIEVE ANALYSIS - % PASSING SIEVES *(SANS 3001-GR1:2010, SANS 3001-GR2:2010)

SIEVE ANALYSIS (GR 1) % PASSING	100.0 mm				
	75.0 mm				
	63.0 mm	100			
	50.0 mm	94		100	
	37.5 mm	85		98	
	28.0 mm	82		93	
	20.0 mm	77		84	
	14.0 mm	75		74	
	5.0 mm	71		47	
	2.0 mm	67	100	35	
	0.425 mm	58	98	24	
	0.075 mm	50	90	15	
GM %		1.2	0.10	2.3	

ATTERBERG LIMITS ANALYSIS - *(SANS 3001-GR10:2010)

ATTERBERG LIMITS (%) SANS GR10,GR11	LIQUID LIMIT	58	54	31
	PLASTICITY INDEX	28	15	10
	LINEAR SHRINKAGE	13.5	5.0	5.0
CLASSIFICATION	H.R.B.	A-7-5(11)	A-7-5(13)	A-2-4(0)
	COLTO	-	-	G7
	TRH 14	G10	-	G7

CALIFORNIA BEARING RATIO - *(SANS 3001-GR30:2010, SANS 3001-GR40:2010)

SANS GR30 MAX. DRY DENSITY	OMC %	7.8	19.0	7.2	
	MDD (kg/m³)	2052	1631	2203	
	COMP MC %	7.2	19.4	7.1	
SWELL % @	MOD NRB PRO	0.02 0.03 0.05	0.03 0.06 0.09	0.05 0.06 0.07	
	100 %	27	7	32	
C.B.R. SANS GR40	98 %	20	6	26	
	97 %	17	5	24	
	95 %	12	4	20	
	93 %	9	3	16	
	90 %	5	2	12	
STABILISER IN LAB		N/A	N/A	N/A	
TEST TYPE		MOD/CBR/IND	MOD/CBR/IND	MOD/CBR/IND	
SAMPLING METHOD		N/A	N/A	N/A	
WEATHER WHEN SAMPLED		N/A	N/A	N/A	

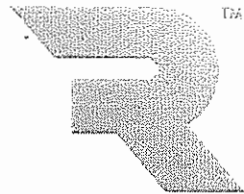
Deviation from Test Method :

Remarks and Notes : Sample numbers D5756 and D5758 worse than G9 Colto, D5758 Worse than G10 TRH 14.

Opinions and interpretations are not included in our accreditation.(T0806)
The samples were subjected to analysis according to (SANS)(TMH5)(DOT)(ASTM)
The test results reported relate to the samples tested.
Further use of the above information is not the responsibility and liability of Roadlab.
Document may only be reproduced or published in their full context.
Report compiled by : Miss Giselle Naidoo

fsanas
Testing Laboratory
Accreditation No. T0806
Prog.ver 10.7 (2019/11/07)

Jay Sanjooparsad
Technical Signatory



ROADLAB

Job Request No.: RD2662/20
Syncline Geotechnical Eng.(Pty) Ltd
197 Peter Mokaba Road
Morningside
4001
Attention : Mr S Pather

Project : Ward 18 Msunduzi

Maximum Dry Density and Optimum Moisture Content

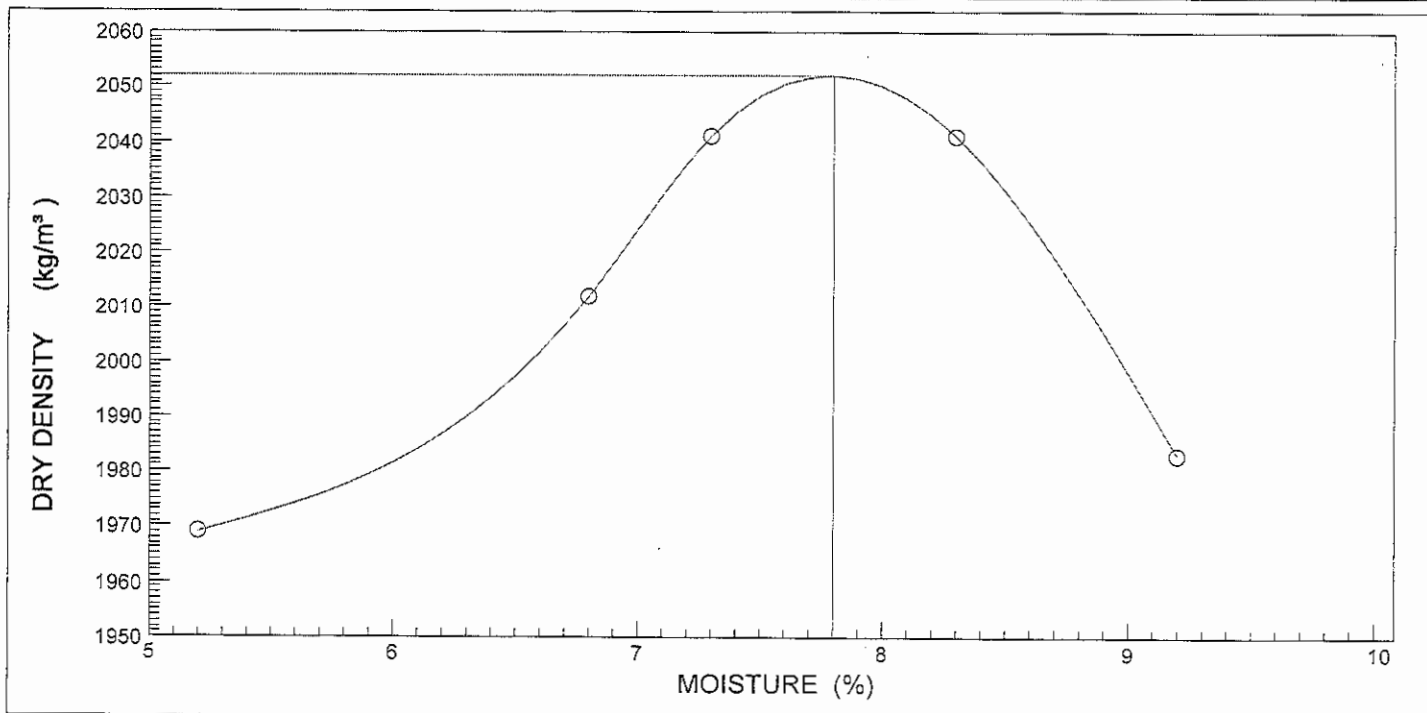
SANS 3001

SAMPLE NO.	D5756
CONTAINER FOR SAMPLING	Plastic bags
SIZE / APPROX. MASS OF SAMPLE	60KG
MOISTURE CONDITION OF SAMPLE	Moist
LAYER TESTED / SAMPLED FROM	Subgrade Fill
MATERIAL DESCRIPTION	Sandy Gravel
HOLE NO. / km / CHAINAGE	TP 1
ROAD NO.	N/A
DATE RECEIVED	25/06/2020
DATE SAMPLED	N/A
CLIENT MARKING	N/A
COLOUR AND TYPE	Moderate Brown

POINT NO.	1	2	3	4	5			
DRY DENSITY (kg/m ³)	1969	2012	2041	2041	1983			
MOISTURE (%)	5.2	6.8	7.3	8.3	9.2			

MAXIMUM DRY DENSITY (kg/m³) : 2052

OPTIMUM MOISTURE CONTENT (%) : 7.8



Deviation from Test Method :

Remarks and Notes :

Opinions and interpretations are not included in our accreditation.(T0806)
The samples were subjected to analysis according to (SANS)(TMH5)(DOT)(ASTM)
The test results reported relate to the samples tested.
Further use of the above information is not the responsibility and liability of Roadlab.
Document may only be reproduced or published in their full context.
Report compiled by : Giselle Naidoo

sanas
Testing Laboratory
Accreditation No. T0806
Prog.ver 10.7 (2019/11/07)

Jay Sarjooparsad
Technical Signatory

Job Request No.: RD2662/20
 Syncline Geotechnical Eng.(Pty) Ltd
 197 Peter Mokaba Road
 Morningside
 4001
 Attention : Mr S Pather

Project : Ward 18 Msunduzi

Maximum Dry Density and Optimum Moisture Content

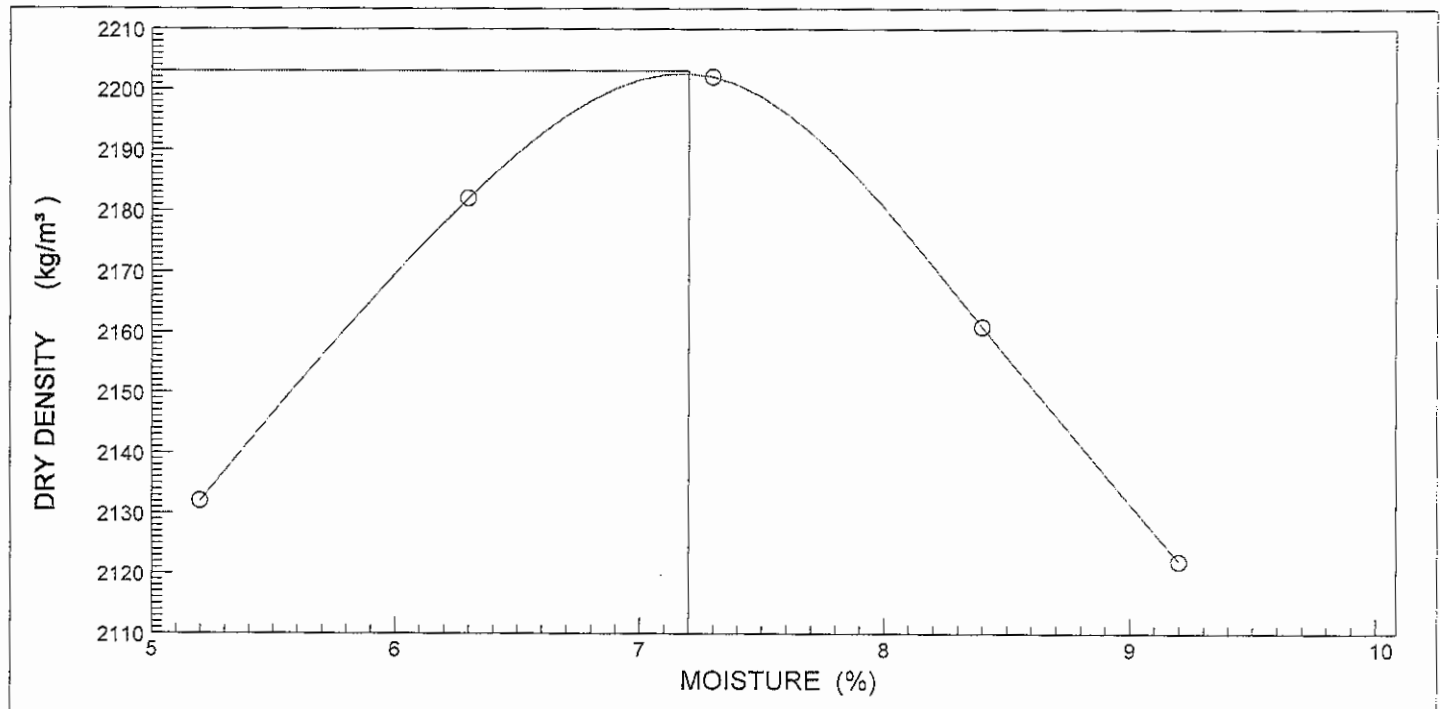
SANS 3001

SAMPLE NO.	D5757
CONTAINER FOR SAMPLING	Plastic bags
SIZE / APPROX. MASS OF SAMPLE	60KG
MOISTURE CONDITION OF SAMPLE	Moist
LAYER TESTED / SAMPLED FROM	Subgrade Fill
MATERIAL DESCRIPTION	Sandy Gravel
HOLE NO./ km / CHAINAGE	TP 2
ROAD NO.	N/A
DATE RECEIVED	25/06/2020
DATE SAMPLED	N/A
CLIENT MARKING	N/A
COLOUR AND TYPE	Light Grey

POINT NO.	1	2	3	4	5			
DRY DENSITY (kg/m ³)	2132	2182	2202	2161	2122			
MOISTURE (%)	5.2	6.3	7.3	8.4	9.2			

MAXIMUM DRY DENSITY (kg/m³) : 2203

OPTIMUM MOISTURE CONTENT (%) : 7.2



Deviation from Test Method :
 Remarks and Notes :

Opinions and interpretations are not included in our accreditation.(T0806)
 The samples were subjected to analysis according to (SANS)(TMH5)(DOT)(ASTM)
 The test results reported relate to the samples tested.
 Further use of the above information is not the responsibility and liability of Roadlab.
 Document may only be reproduced or published in their full context.
 Report compiled by : Giselle Naidoo

sanas
 Testing Laboratory
 Accreditation No. T0806
 Prog.ver 10.7 (2019/11/07)

Jay Sarjooparsad
 Technical Signatory

Job Request No.: RD2662/20
 Syncline Geotechnical Eng.(Pty) Ltd
 197 Peter Mokaba Road
 Morningside
 4001
 Attention : Mr S Pather

Project : Ward 18 Msunduzi

Maximum Dry Density and Optimum Moisture Content

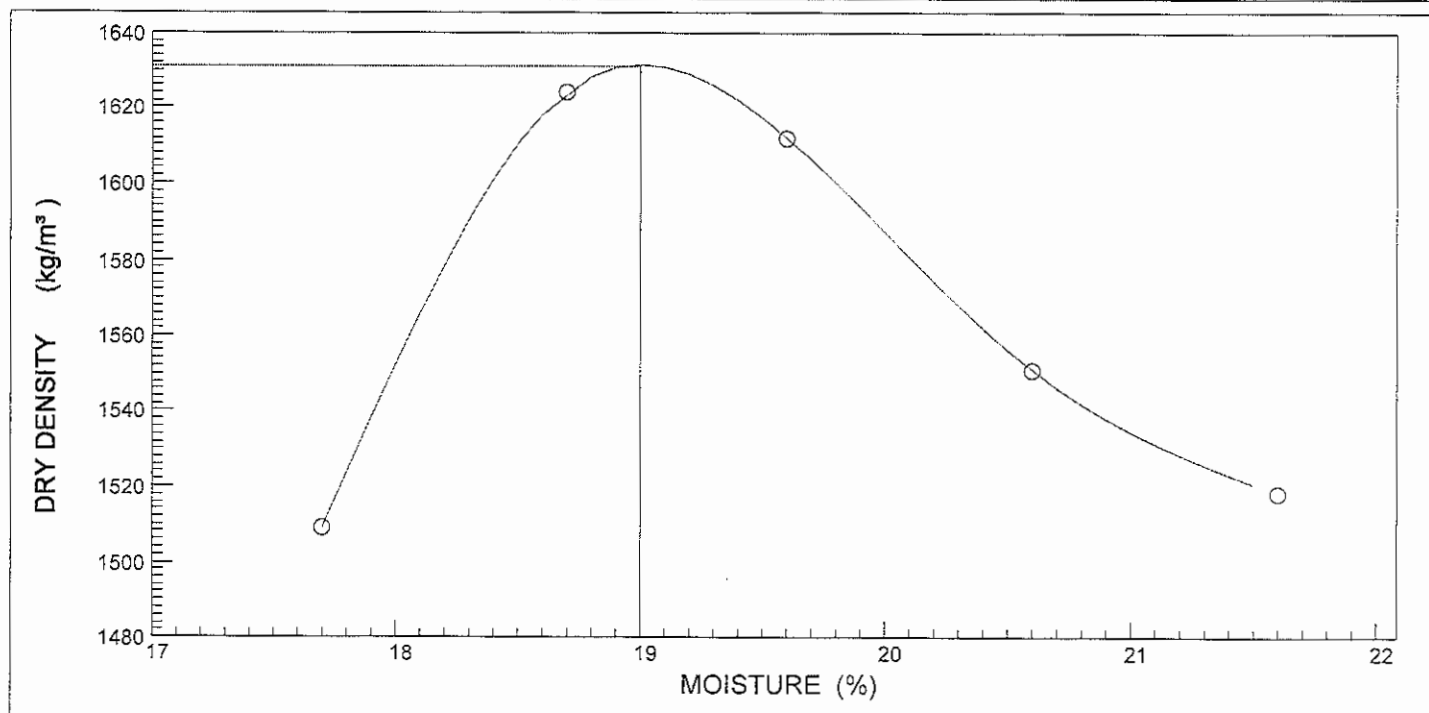
SANS 3001

SAMPLE NO.	D5758
CONTAINER FOR SAMPLING	Plastic bags
SIZE / APPROX. MASS OF SAMPLE	60KG
MOISTURE CONDITION OF SAMPLE	Moist
LAYER TESTED / SAMPLED FROM	Subgrade Insitu
MATERIAL DESCRIPTION	Silty Sandy Clay
HOLE NO./ km / CHAINAGE	TP 3
ROAD NO.	N/A
DATE RECEIVED	25/06/2020
DATE SAMPLED	N/A
CLIENT MARKING	N/A
COLOUR AND TYPE	Reddish Brown

POINT NO.	1	2	3	4	5			
DRY DENSITY (kg/m ³)	1509	1624	1612	1551	1518			
MOISTURE (%)	17.7	18.7	19.6	20.6	21.6			

MAXIMUM DRY DENSITY (kg/m³) : 1631

OPTIMUM MOISTURE CONTENT (%) : 19.0



Deviation from Test Method :
 Remarks and Notes :

Opinions and interpretations are not included in our accreditation.(T0806)
 The samples were subjected to analysis according to (SANS)(TMH5)(DOT)(ASTM)
 The test results reported relate to the samples tested.
 Further use of the above information is not the responsibility and liability of Roadlab.
 Document may only be reproduced or published in their full context.
 Report compiled by : Giselle Naidoo

sanas
 Testing Laboratory
 Accreditation No. T0806
 Prog.ver 10.7 (2019/11/07)

Jay Sangooparsad
 Technical Signatory

SOILCO MATERIALS INVESTIGATIONS (PTY) LTD



CIVIL ENGINEERING MATERIALS TESTING LABORATORY

Reg. No. : 1965 / 009585 / 07

11 HALSTED ROAD - 24 DAVLEN PARK - MKONDENI - P.O.BOX 846 PIETERMARITZBURG - 3200

TELEPHONE : 033 - 386 9095 TELEFAX : 033 - 386 1878 email : balin@soilco.co.za



T 0823

Date : 2020-06-23

For the Attention of :

Customer Name : Midmar Crushers

Address : P.O.Box 422
Merrivale
3291

Project Information : Taylors Halt Quarry

Job Card Number : 225597

Sample Number / s : P10357 - P10358

Dear Sir / Madam,

Herewith, please find the original report / s, pertaining to the above - mentioned project. All tests conducted are in accordance with prescribed test method / s. Information herein consists of the following : -

Materials Report and Reference No.	Test Conducted	Prescribed Method	No. of Pages
Materials Report (Soilco SF 33)	Sieve Analysis	SANS 3001 GR 1	1
	Atterberg Limits	SANS 3001 GR 10 - GR 12	
	The Determination of Maximum Dry Density & Optimum Moisture Content	SANS 3001 GR 30	
	California Bearing Ratio	SANS 3001 GR 40	
Moisture / Density Relationship (Soilco SF 38)	The Determination of Maximum Dry Density & Optimum Moisture Content	SANS 3001 GR 30	2
Aggregate Test Report-Graded C/Rock (Soilco SF56)	Sieve Analysis to 75 mic	SANS 3001 AG 1	1

We thank you for your valued support and look forward to assisting you in the near future.

Yours faithfully,

For Soilco (Technical Signatory)

The following results pertain only to the area or samples tested. Whilst every precaution is taken to ensure accurate testing and reporting, Soilco Materials Investigations (Pty) Ltd will not be held responsible for any erroneous testing or reporting thereof.

Information in relation to the client and associated test results are considered proprietary, regard as confidential, and will not be reproduced or disclosed to any person or organization without prior written consent from the client, i.e. unless prohibited by law or covered by legally enforceable, signed confidentiality undertakings (i.e. SANAS Assessors or Internal Auditors).

If the arrangement is not suitable to you, our client, please contact the management of Soilco Materials Investigations (Pty) Ltd.

Tests marked * in this report are " Not SANAS Accredited " and are not included in the SANAS Schedule of Accreditation for this Laboratory. # Opinions and Interpretations expressed herein are Outside the Scope of SANAS Accreditation.

Deviation from Test Method : - Moisture Contents Dried Overnight at 105°C to 110°C.

Page 1 of 4

SOILCO MATERIALS INVESTIGATIONS (PTY) LTD



CIVIL ENGINEERING MATERIALS TESTING LABORATORY

Reg. No. : 1965 / 009585 / 07

11 HALSTED ROAD - 24 DAVLEN PARK - MKONDENI - P.O.BOX 846 PIETERMARITZBURG - 3200

TELEPHONE : 033 386 9095 TELEFAX : 033 386 1878 email : balin@soilco.co.za



T 0823

Customer : Midmar Crushers
Project : Taylors Halt Quarry

Job Card No. : 225597
Date Received : 2020-06-15
Date Tested : 2020-06-15-2020-06-19
Date Reported : 2020-06-23

Sampling Process : Samples Delivered by Customer

MATERIALS TEST REPORT

Laboratory Number	P10401	P10402			
Field Number					
Position in field	G2	G5			
Depth (mm)					
Sample Description	Grey Blue Crushed Dolerite Rock	Grey Blue Crushed Dolerite Rock			
Stabilising Agent	Cement				

Sieve Analysis (Wet Preparation) SANS 3001 - GR 1

100.0 mm	Percentage Passing				
75.0 mm					
63.0 mm					
50.0 mm			100		
37.5 mm		100	97		
28.0 mm		94	86		
20.0 mm		84	72		
14.0 mm		74	55		
5.0 mm		45	32		
2.0 mm		30	20		
0.425 mm		15	10		
0.075 mm		6	4		
Grading Modulus SANS 3001 PR 5		2,49	2,66		

Mechanical Analysis - SANS 3001 - GR 1

Coarse Sand (%)	50	51			
Coarse - Fine Sand (%)	12	11			
Medium - Fine Sand (%)	9	10			
Fine - Fine Sand (%)	7	7			
Silt and Clay (%)	22	21			

Atterberg Limits - SANS 3001 - GR 10 and GR 12

Liquid Limit (%)	0	0			
Plasticity Index (%)	NP	NP			
Linear Shrinkage (%)	0,0	0,0			

Classification

Classification Group Index	A1-a(0)	A1-a(0)			
COLTO Classification #	G2	G6			
TRH 14 Classification (1985) #	G2	G5			

Maximum Dry Density and Optimum Moisture Content - SANS 3001 - GR 30

Maximum Dry Density (kg/m³)	2410	2435			
Optimum Moisture Content (%)	4,6	3,2			

California Bearing Ratio - SANS 3001 - GR 40

CBR @ 100 % Compaction	110	79			
CBR @ 98 % Compaction	90	71			
CBR @ 95 % Compaction	66	61			
CBR @ 93 % Compaction	54	55			
CBR @ 90 % Compaction	40	48			
Swell @ 100 % Compaction	0,02	0,01			

Remarks :

The Colto / TRH 14 Classifications are only based on the above results. Further testing may be required.

[Signature]

SOILCO MATERIALS INVESTIGATIONS (PTY) LTD

CIVIL ENGINEERING MATERIALS TESTING LABORATORY



Reg. No. : 1965 / 009585 / 07

11 HALSTED ROAD - 24 DAVLEN PARK - MKONDENI - P.O.BOX 846 - PIETERMARITZBURG 3200

TELEPHONE : 033 - 3869095 : TELEFAX 033 - 3861878 - email : balin@soilco.co.za



T 0823

Client : Midmar Crushers
Project : Taylors Halt Quarry

Job Card No. : 226809
Date Received : 2020-07-01
Date Tested : 2020-07-03
Date Reported : 2020-07-06

Sampling Process : Samples Delivered by Customer

Laboratory Number : P10401

Field Reference No. :

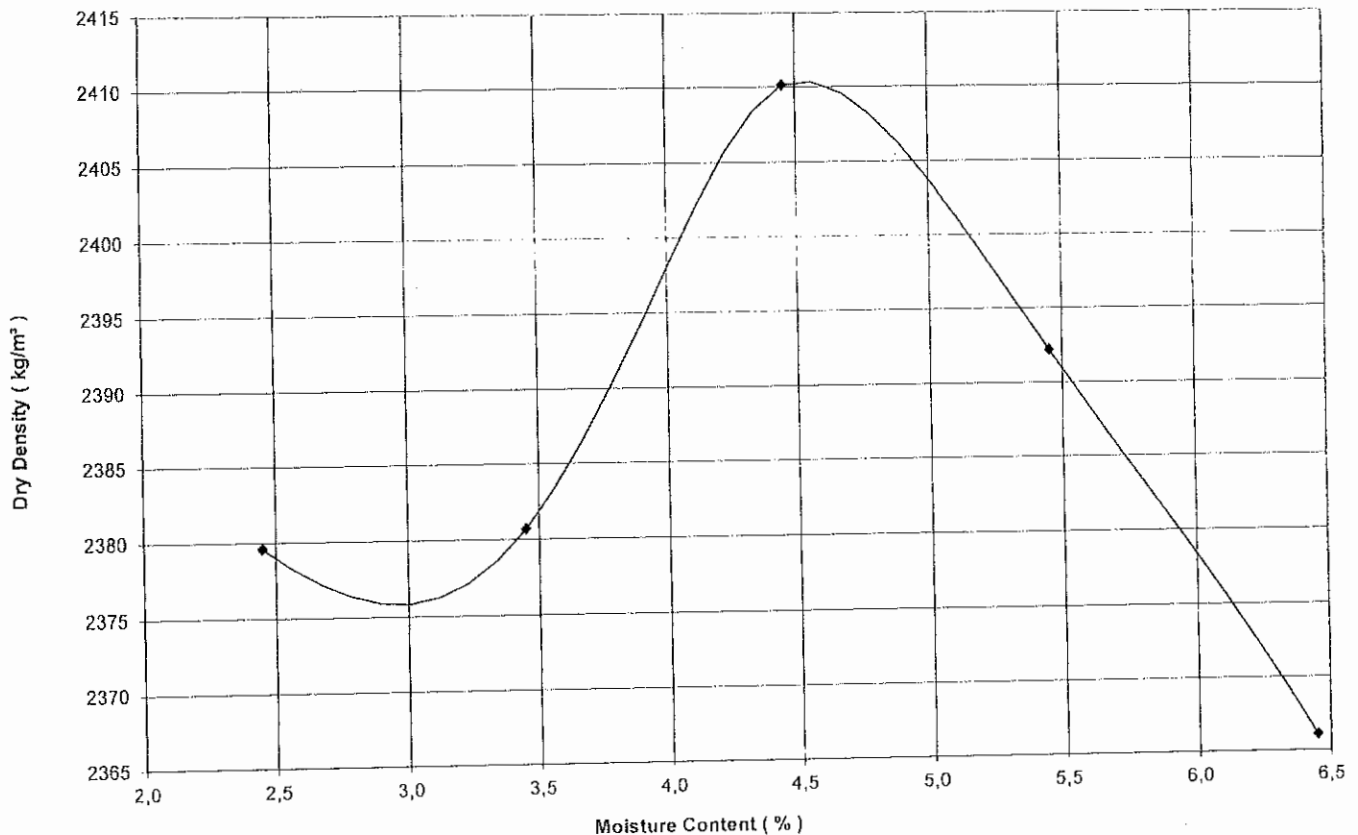
Position in field : G2

Depth (mm) :

Material Description : Grey Blue Crushed Dolerite Rock

MOISTURE / DENSITY RELATIONSHIP - SANS 3001 - GR30

Moisture Content; (%)	2,5	3,5	4,5	5,5	6,5	Maximum Dry Density	2410 kg/m ³
Dry Density (kg/m ³)	2380	2381	2410	2392	2366	Optimum Moisture Content	4,6 %



Page 3 of 5

Remarks :

Method of Preparation : Scalping Process

For Soilco :

P. Govender (Technical Signatory)

SOILCO MATERIALS INVESTIGATIONS (PTY) LTD

CIVIL ENGINEERING MATERIALS TESTING LABORATORY



Reg. No. : 1965 / 009585 / 07

11 HALSTED ROAD - 24 DAVLEN PARK - MKONDENI - P.O.BOX 846 - PIETERMARITZBURG 3200

TELEPHONE : 033 - 3869095 : TELEFAX 033 - 3861878 - email : balin@soilco.co.za



T 0823

Client : Midmar Crushers
Project : Taylors Halt Quarry

Job Card No. : 226809
Date Received : 2020-07-01
Date Tested : 2020-07-03
Date Reported : 2020-07-10

Sampling Process : Samples Delivered by Customer

Laboratory Number : P10402

Field Reference No. :

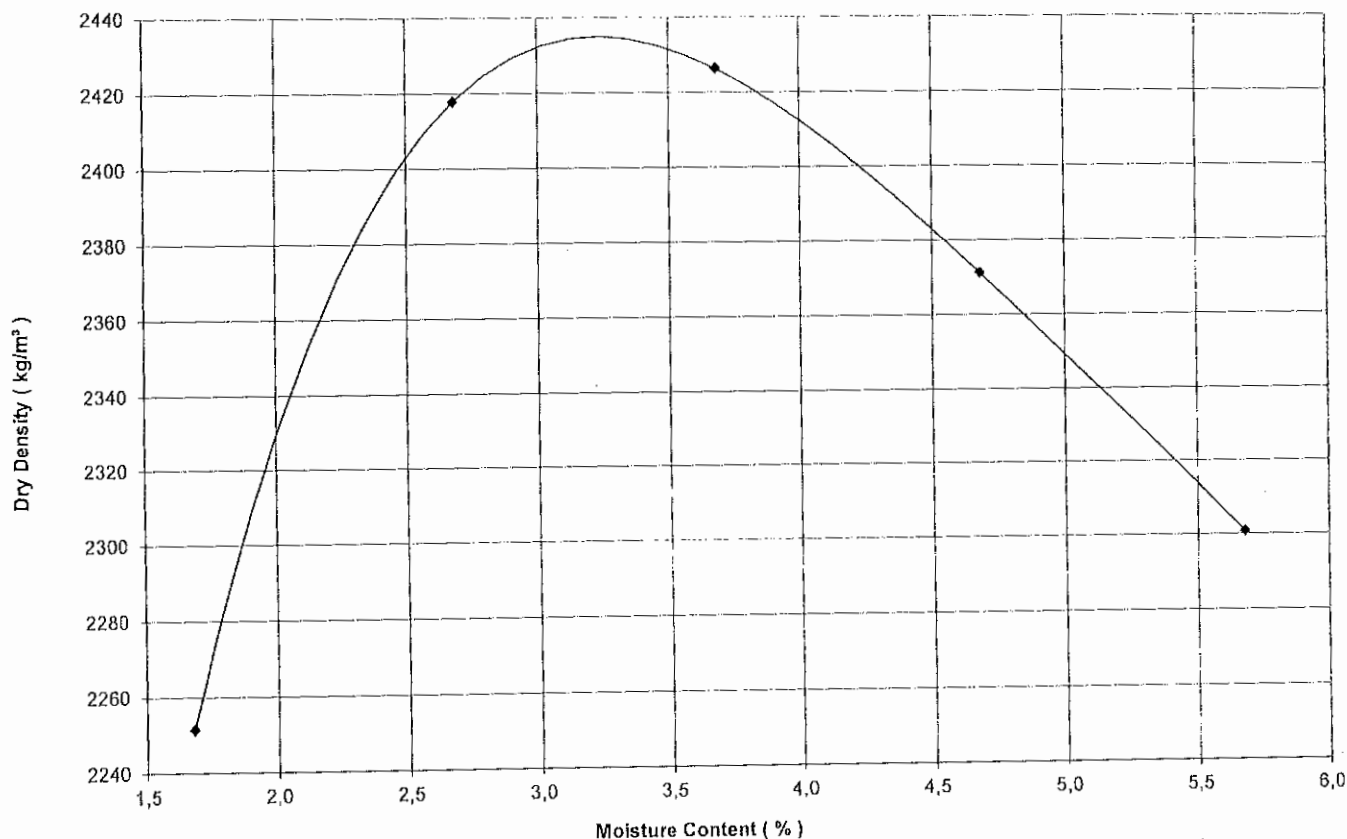
Position in field : G5

Depth (mm) :

Material Description : Grey Blue Crushed Dolerite Rock

MOISTURE / DENSITY RELATIONSHIP - SANS 3001 - GR30

Moisture Content; (%)	1,7	2,7	3,7	4,7	5,7	Maximum Dry Density	2435 kg/m ³
Dry Density (kg/m ³)	2251	2418	2426	2371	2301	Optimum Moisture Content	3,2 %



Page 4 of 5

Remarks :

Method of Preparation : Scalping Process

For Soilco :

P. Govender (Technical Signatory)

SOILCO MATERIALS INVESTIGATIONS (PTY) LTD

CIVIL ENGINEERING MATERIALS TESTING LABORATORY



Reg. No. : 1965/09585/07



11 HALSTED ROAD - 24 DAVLEN PARL - MKONDENI - P.O.Box 846 PIETERMARITZBURG 3200

TELEPHONE : 033 386 9095 TELEFAX : 033 386 1878 email : balin@soilco.co.za / hazel@soilco.co.za

Customer : Midmar Crushers

Job Card No. : 226809

Project : Taylors Halt Quarry

Date Received : 2020-07-01

Date Tested : 2020-07-03

Sampled by : Client

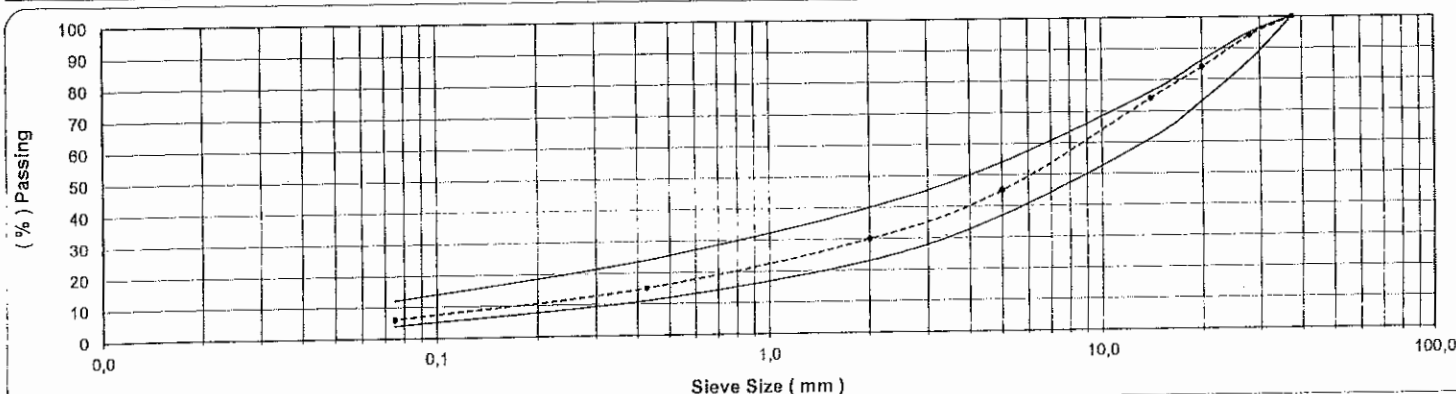
Date Reported : 2020-07-10

AGGREGATE TEST REPORT - GRADED CRUSHED ROCK

Laboratory No.	P10401	# TRH 14 Specification (G 2) 37.5 mm Graded Crushed Rock
Field No.	-	
Position in Field	G2	
Depth (mm)		
Material Description	Grey Blue Crushed Dolerite Rock	

Sieve Analysis (%) SANS AG 1			Minimum	Maximum
Sieve Aperture	50,0	mm		
	37,5	mm	100	100
	28,0	mm	86	95
	20,0	mm	73	86
	14,0	mm	61	76
	5,0	mm	37	54
	2,0	mm	23	40
	0,425	mm	11	24
	0,075	mm	4	12

Material Characteristics			Minimum	Maximum
Flakiness Index (%)	SANS AG 4		-	35
Liquid Limit (%)	SANS GR 12		-	25
Plasticity Index (%)	SANS GR 10		-	6
Apparent Relative Density	SANS AG 22		-	-
Aggregate Crushing Value (%)	TMH 1 B1		-	29
10% Fact (kN)	TMH 1 B2		110	-



Page 5 of 5

For Soilco :

[Signature]

P Govender (Technical Signatory)

Page 3 of 3

2005-05-26

Revision 1

Soilco SF 65

FIGURE 1

July 28, 2020

SITE PLAN (Road L3168)

NORTH



Test Position	Latitude (S)	Longitude (E)
TP1/DCP1	S29° 40' 49.3"	E30° 22' 25.8"
TP2/DCP2	S29° 40' 57.9"	E30° 22' 24.8"
TP3/DCP3	S29° 41' 02.3"	E30° 22' 31.2"



TP1 – Approximate position of Test Pit

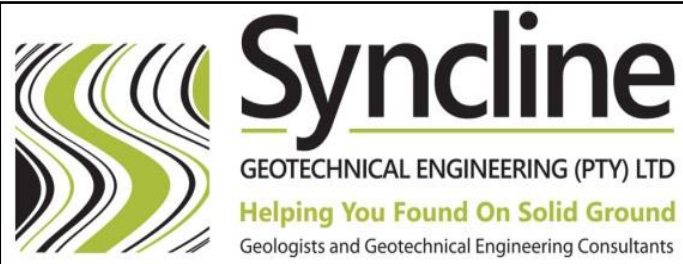
DCP1 – Approximate position of CBR Dynamic Cone Penetrometer (DCP) Test

Image sourced from Google Earth 2020

Latitude: S29° 40' 49.3"

Longitude: E30° 22' 25.8"

Scale: As shown on image



PROJECT: Ward 18 Road - Msunduzi Municipality

CLIENT: TLS Engineers & Project Managers

DATE: 28 July 2020

PROJECT REFERENCE NUMBER: SGE-060-2020

DRAWN BY: K. Govender

FIGURE NUMBER: 1 - Site Plan (Road M89)

CHECKED BY: S. Pather

REVISION: 0