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Report to Escongweni BPH Engineers (Pty) Ltd on the Results of a Geotechnical Investigation for the Proposed Construction of the Mpolweni Water Supply Scheme, Ward 9 and Ward 10, uMshwathi Local Municipality, uMgungundlovu District Municipality, Kwa-Zulu Natal

Reference: 085-20.R01 Revision 0

Dated: 18 June 2020

LEVEL 1 BEE CONTRIBUTOR

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Report Title		Report to Escongweni BPH Engineers (Pty) Ltd on the Results of a Geotechnical Investigation for the Proposed Construction of the Mpolweni Water Supply Scheme, Ward 9 and Ward 10, uMshwathi Local Municipality, uMgungundlovu District Municipality, Kwa-Zulu Natal			
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085-20.R01	18/06/2020	Geotechnical report with recommendations		Mr F. Smith	Mr A. Ramroop
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Author Signature			**Reviewer Signature**		
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Report to Escongweni BPH Engineers (Pty) Ltd on the Results of a Geotechnical Investigation for the Proposed Construction of the Mpolweni Water Supply Scheme, Ward 9 and Ward 10, uMshwathi Local Municipality, uMgungundlovu District Municipality, Kwa-Zulu Natal

Reference: 085-20.R01 Revision 0 **Date: 18 June 2020**

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ABBREVIATIONS AND DEFINITIONS

Abbreviation	Definition
AASHTO	American Association of State Highway and Transportation
CBR	California Bearing Ratio
DCP	Dynamic Cone Penetrometer
DPL	Dynamic Cone Penetrometer - Light
E	east
EGL	existing ground level
EXP	exposure
Geosure	Geosure (Pty) Ltd
GM	grading modulus
GPS	Global Positioning System
h	horizontal
IMC	insitu moisture content
IP	inspection pit
km	kilometre(s)
kN/m^2	kilonewtons per metre square
LL	liquid limit
LS	linear shrinkage
m	metre (s)
m/s	metres per second
MDD	maximum dry density
Ml	Mega litre
mm	Millimetre(s)
mPa	MegaPascal
No.	number
NP	non plastic
PI	plasticity index
SANS	South African National Standards
S	south
TLB	Tractor Loader Backhoe
TMH	Technical Manual for Highways
TRH	Technical Recommendations for Highways (1985)
UCS	unconfined compressive strength
USCS	Unified Soil Classification System
v	vertical
Unified Soil Classification System	
CL	Inorganic clays of low to medium plasticity
GM	Silty GRAVELS
ML	Inorganic silts and very fine sand
MH	Inorganic silts and micaceous fine sands
OH	Organic clays of medium to high plasticity
OL	Organic silt and clay of low plasticity

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Reference: 085-20.R01 Revision 0 **Date: 18 June 2020**

1. TERMS OF REFERENCE

Geosure was invited by Escongweni BPH Engineers (Pty) Ltd to tender on the provision of professional services for the geotechnical investigation of the proposed Mpolweni and Thokozani Water Supply Schemes in uMshwathi Local Municipality, uMgungundlovu District Municipality, Kwa-Zulu Natal.

The proposed Scope of Works and Bill of Quantities were set out in a Request for Quotation document referenced 03-2101-01-07 and 09 April 2020, titled "*Request For Quotation: Mpolweni and Thokozani Water Supply Scheme Tender for Site Geotechnical Investigation Services"*, attached to an electronic mail dated 09 April 2020 and prepared by Escongweni BPH Engineers (Pty) Ltd.

In an electronic mail dated 15 April 2020 and prepared by Escongweni BPH Engineers (Pty) Ltd, additional information relating to the scope of works was set out in documentation dated 15 April 2020 and titled "*Request For Quotation: Mpolweni and Thokozani Water Supply Scheme Tender for Site Geotechnical Investigation Services-Addendum No.1*".

Accordingly, Geosure submitted a proposal and supporting documentation under the cover of a letter referenced p209-20 (Mpolweni WSS)/mb and dated 23 April 2020.

Subsequently, Geosure was authorised by Escongweni BPH Engineers (Pty) Ltd to carry out the geotechnical investigation as proposed in an unreferenced appointment letter, titled *"Re: Appointment for Geotechnical Investigations Required for the Construction of the Mpolweni and Thokozani Water Supply Schemes, within uMgungundlovu District Municipality"*, dated 20 April 2020. Signed acceptance of the above proposal by Geosure, is dated 06 May 2020. The appointment of Geosure was followed up with the signing of a sub-consultancy agreement between Escongweni BPH Engineers (Pty) Ltd and Geosure dated 07 May 2020. The scope of geotechnical specialist services is set out in Schedule 2 of the above sub-consultancy document.

2. SCOPE OF REPORT

This report details the results of a geotechnical investigation for the proposed bulk and reticulated pipelines, 3ML Reservoir and 200KL Elevated Tank making up the Mpolweni Water Supply Scheme, within Ward 9 and Ward 10 of uMshwathi Local Municipality, uMgungundlovu District Municipality, Kwa-Zulu Natal, and hereafter referred to as the site.

Subsurface conditions identified on the site are described and assessed. General comment is made on the inferred stability of the site, excavation conditions and founding conditions. Recommendations for reservoir and elevated tank foundations, material usage, lateral support, and drainage are also provided to guide engineering design.

3. GUIDELINES FOR INVESTIGATION METHODOLOGY

The formation and weathering of geological materials are discontinuous processes and unexpected variations in soil, rock and groundwater regimes may occur even on sites where the conditions seem to be uniform or consistent. Variations in what is reported here may become evident or construction. It is thus imperative that an appropriately qualified and experienced Competent Person inspects all critical stages of development including, but not limited to, excavations to assess the conditions identified, as well as conditions from the final depths investigated to those at the deepest construction levels, and to assist in the interpretation of observations at variance with the information supplied in this report.

This report was prepared for use by Escongweni BPH Engineers (Pty) Ltd and their professional team, for the purpose stated, and as such should not be relied upon for any other purpose.

4. INFORMATION SUPPLIED/UTILISED

The following information was consulted to assist with the field investigation and preparation of this report:

i. Request for Quotation document referenced 03-2101-01-07 and 09 April 2020, titled "*Request For Quotation: Mpolweni and Thokozani Water Supply Scheme Tender for Site Geotechnical Investigation Services"*, attached to an electronic mail dated 09 April 2020 and prepared by Escongweni BPH Engineers (Pty) Ltd;

ii. Documentation prepared by Escongweni BPH Engineers (Pty) Ltd dated 15 April 2020 and titled "*Request For Quotation: Mpolweni and Thokozani Water Supply Scheme Tender for Site Geotechnical Investigation Services- Addendum No.1*";

iii. Electronic (.dwg) files of the site inclusive of contours in .pdf;

iv. Electronic file of Drawing 031-2101-2-3-200-1_A, Revision A, dated 25 April 2019, titled *"Mpolweni Battery Limit Layout"* by Escongweni BPH Engineers (Pty) Ltd;

v. Electronic file of Drawing 2101-01-220-03 Revision A dated 15 May 2020, titled "*Lindokuhle, Mpolweni Ext. and Esihalbathini Water Supply Scheme 3ML Bulk Storage Reservoir Outlet Chamber Layout Concrete and Pipework Details*" by Escongweni BPH Engineers (Pty) Ltd;

vi. Electronic file of Drawing 2101-01-220-02 Revision A dated 15 May 2020, titled "*Lindokuhle, Mpolweni Ext. and Esihalbathini Water Supply Scheme 3ML Bulk Storage Reservoir Inlet Chamber Layout Concrete and Pipework Details*" by Escongweni BPH Engineers (Pty) Ltd;

vii. Details of proposed layerworks beneath the proposed reservoir and pipe invert levels included in electronic mails dated 11 June 2020 from Escongweni BPH Engineers (Pty) Ltd;

viii. Details of un-factored foundation loads for proposed 200 kl Elevated Tank shown on Drawing No. RD136506/01 Revision A by ABECO TANKS (Pty) Ltd dated June 2020, and titled *"H.D. Bolt Plan and Foundation Loads"* included in electronic mail dated 18 June 2020 from Escongweni BPH Engineers (Pty) Ltd;

ix. Details of working load bearing pressures for proposed 3ML Reservoir and 200 kl Elevated Tank included in electronic mail dated 30 June 2020 from Escongweni BPH Engineers (Pty) Ltd;

x. Regional geological map sheet titled *"2930 Durban"*, dated 1988 and published by the Council for Geoscience of South Africa to scale 1:250 000; and

xi. Low-resolution aerial imagery sourced from Google Earth (2019).

5. SITE/ROUTE DESCRIPTION

The site is bordered to the east and west by the R614 to Wartburg and the R33 between Pietermaritzburg and Greytown, respectively. Pietermaritzburg is located approximately 50km to the south of the site.

The site area measures approximately 15.9km² (1590 hectares), and encompasses the tribal areas of Emvundlweni, Newtown, Emseni, Ekukhuleni, Vundla Road, Ematshali Extension 1 and Kogcwabaza.

The approximate co-ordinates of the site comprise 29°25'15.71''South and 30°28'49.99''East.

The regional setting of the site is shown below in Plate 1.

Plate 1: Regional setting of the site (Google Earth, 2018)

The site is defined by undulatory terrain, with highlands in the extreme southeast and northwest, which shed off along hillsides into valleys and numerous drainage routes shown in Figure 085-20.R01.001, attached. The hillsides display mild to moderate gradients, steepening generally in the northern, north-eastern and south-eastern portions of the site.

River / stream flows were noted along two of the drainage courses graded southwards and south-westwards in the western and southern portions of the site and a north-easterly graded drainage course in the northern site area.

A quarry is located in the north-eastern extremity of the site.

The site for the proposed 3ML Reservoir is located on a hilltop adjacent to the western site boundary.

The proposed 200kl Elevated Tank is to be located on a northerly sloping hillside adjacent to the south-eastern site limit, in the close vicinity to an existing circular reservoir of unconfirmed capacity.

The local setting of the site is shown below in Plate 2.

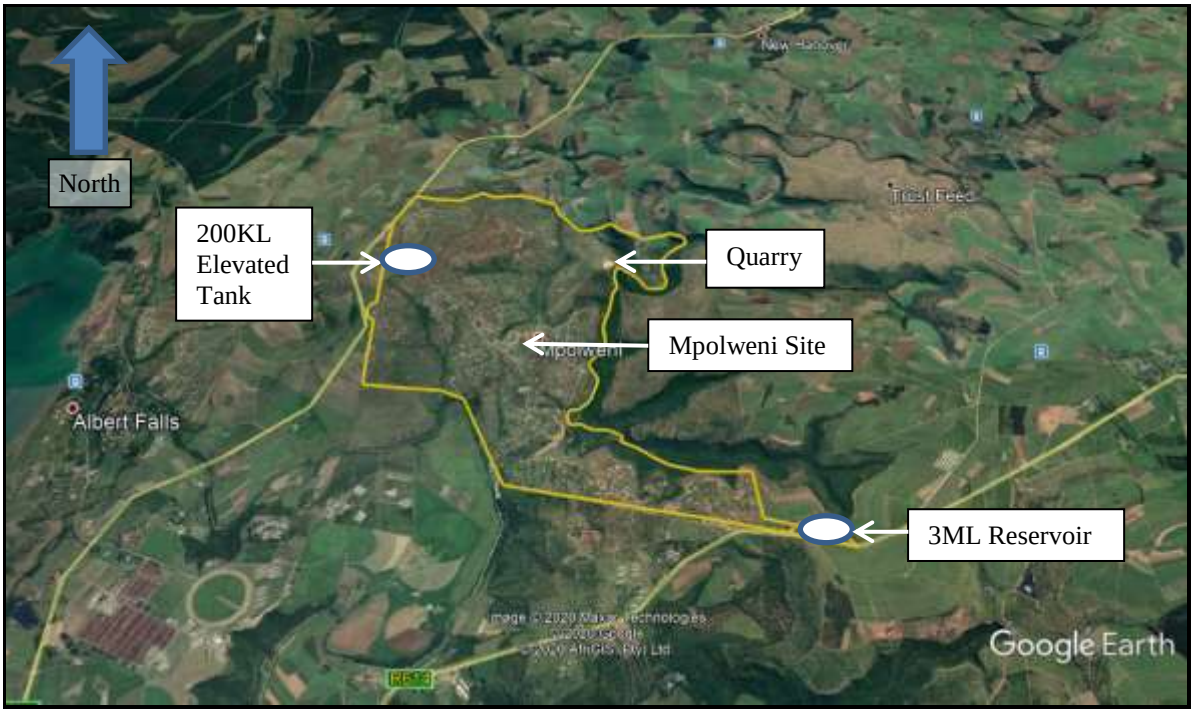

Plate 2: Local setting of the site (Google Earth, 2020)

The site has been designated by others into 13 No. zones, comprising Zone 1, Zone 2A, Zone 2B, Zone 2C, Zone 3A, Zone 3B, Zone 3C, Zone 3D, Zone 3D-1, Zone 3D-2, Zone 4A, Zone 4B and Zone 4C.

Plate 3 below depicts the aerial image and proposed overall layout of the bulk and reticulation pipelines at the site.

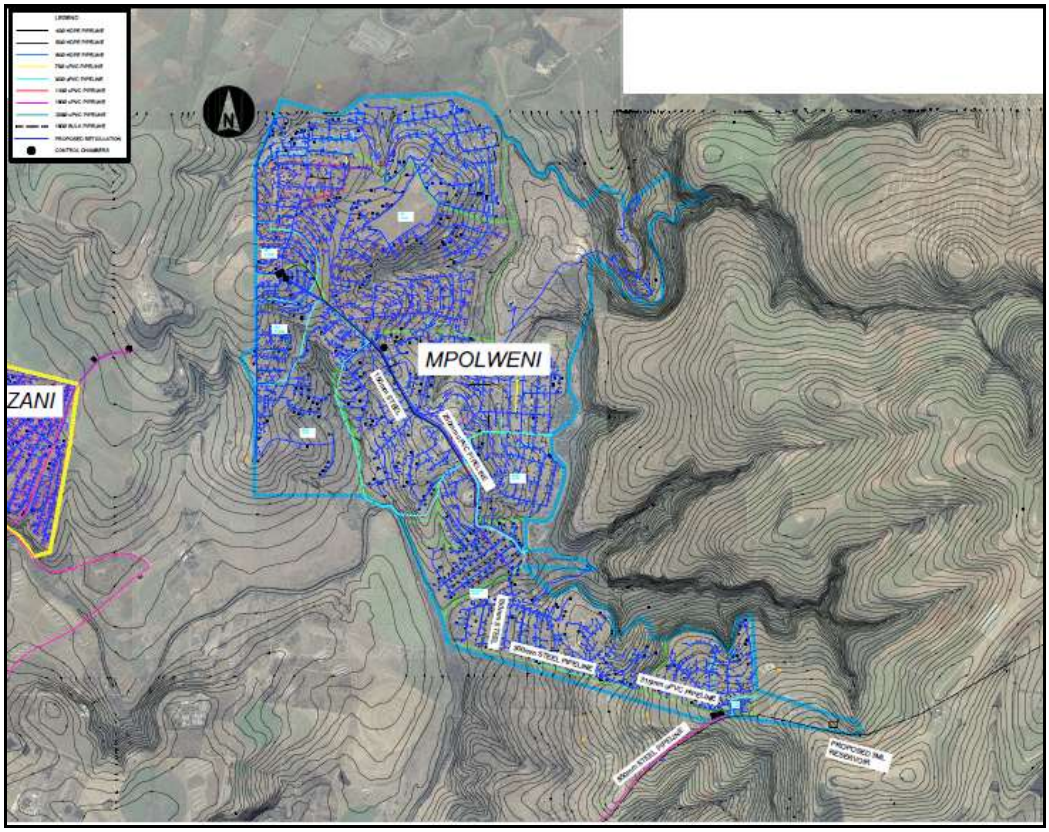

Plate 3: Aerial image showing proposed water layout at the site
(Acknowledgement to Escongweni BPH Engineers (Pty) Ltd)

The overall site layout inclusive of contours and the 13 No. proposed zones is shown in Figure 085-20.R01.001, attached.

Approximate latitude and longitude coordinates of the start and end points of the bulk pipeline and the proposed elevated tank and reservoir positions are summarised in Table 1, below.

Table 1: Proposed Mpolweni Water Supply Scheme – Summary of Coordinates of Bulk Pipeline, 200KL Elevated Tank, 3ML Reservoir and Quarry

Structure	Latitude (South)	Longitude (East)	Description
Bulk Pipeline	29°25'15.71''	30°28'49.99''	Start point adjacent to 200KL Elevated Tank
Bulk Pipeline	29°26'52.90"	30°30'10.80"	Assumed end point in south-eastern corner of site
Tank	29°24'52.50''	30°28'01.50''	200KL Elevated Tank
Reservoir	29°27'15.30''	30°31'12.90''	3ML Reservoir
Quarry	29°24'39.98''	30°29'50.41''	Northern edge of Lethingcebo Pit / Quarry

General views across the site are given in Plate 4 to Plate 7, below.

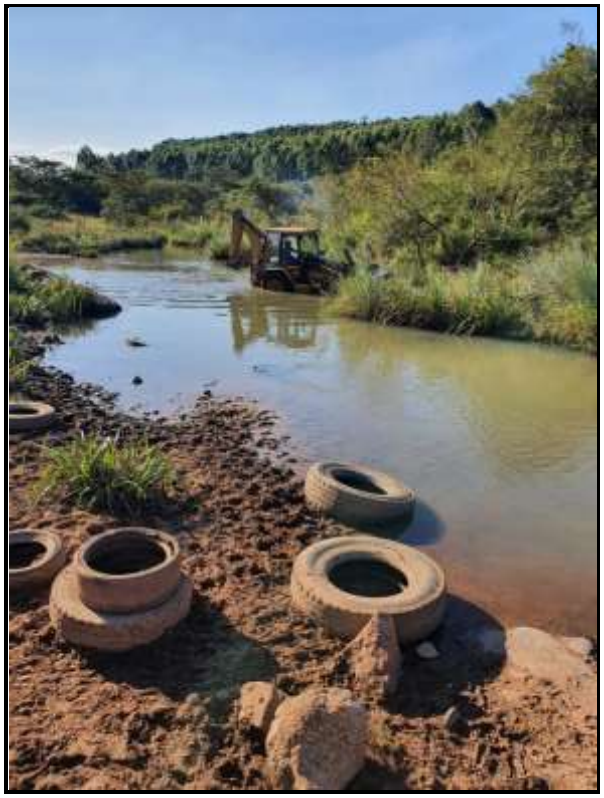

Plate 4: View of route of river / stream crossing

Plate 5: General easterly view of site

Plate 6: General view of Lethingcebo Quarry

Plate 7: General view of site for 3 ML Reservoir

6. FIELDWORK

Following a desktop appraisal of aerial and regional geological records, the fieldwork for the investigation was carried out from 13 May 2020 to 15 May 2020, and comprised the following scope of works:

i. Terrain Appraisal;
ii. Inspection Pits;
iii. CBR Dynamic Cone Penetrometer (DCP) Tests; and
iv. Dynamic Cone Penetrometer – Light (DPL) Tests.

The extent of the fieldwork was defined in the RfQ Addendum document by Escongweni BPH Engineers (Pty) Ltd and referenced above in Section 4, paragraph ii).

Latitude and longitude coordinates were recorded by means of a handheld GPS unit in the field, and indicated on inspection pits. X, Y and Z values are included in Figures 085-20.R01.001 to 085-20.R01.003, attached.

6.1 Terrain Appraisal

Prior to commencing with the subsurface investigation, a reconnaissance of the site was carried out to identify the topography and associated landforms, map the surface geology and note and photograph allied features of geotechnical significance.

During the terrain appraisal, ten exposures designated EXP1 through EXP10 were profiled along the proposed pipeline routes.

The approximate positions of the exposures profiled are shown in Figure 085-20.R01.001, attached.

The exposures were profiled using the South African Geoterminology Guidelines (Brink & Bruin, 2002).

Copies of the exposure profiles are given in Appendix A.

6.2 Inspection Pits

Eight inspection pits, designated IP1 to IP8, and fifty inspection pits, designated IP9 to IP58, were excavated across the site for the 200 KL Elevated Tank and 3ML Reservoir, and bulk / reticulation Pipelines, respectively, by means of a TLB at the approximate positions given in Figure 085-20.R01.001 to 085-20.R01.003, attached.

Final / refusal depths of the inspection pits ranged from 0.24m (IP17 refers) to 3.5m (IP9 – IP11, IP24, IP26, IP28, IP34, IP36, IP42, IP43 and IP56 refer) below EGL.

The inspection pits were profiled using the South African Geoterminology Guidelines (Brink & Bruin, 2002), sampled and backfilled on completion.

Copies of the inspection pit profiles are given in Appendix A.

6.3 CBR Dynamic Cone Penetrometer (DCP) Tests

Eight DCP Tests, designated DC1 to DC8, and fifty DCP Tests, designated DC9 to DC58, were carried out across the site for the 200 KL Elevated Tank and 3ML Reservoir, and Pipelines, respectively, at the approximate positions given in Figure 085-20.R01.002 and 085-20.R01.003, attached.

DCP tests were advanced to final/refusal depths in the range 0.2m (DC17, DC39, DC48 and DC57 refer) to 3.5m (DC1 – DC3, DC21, DC24, DC34, DC36, DC37, DC42 and DC34 refer) below EGL.

Graphs of the DCP tests are given in Appendix B.

6.4 Dynamic Cone Penetrometer Light (DPL) Tests

Two DPL tests, designated DPL1 to DPL2, were carried out at the land for the proposed 200KL Elevated Tank at the approximate positions given in Figure 085-20.R01.002, attached.

The DPL tests were advanced to refusal at depths in the range 3.9m (DPL1 refers) and 4.8m (DPL2 refers) below EGL.

Graphs of the DPL tests are given in Appendix C.

7. REGIONAL GEOLOGY AND INFERRED SOILS

Inferring from the regional geological sheet *"2930"*, prepared by the Council for Geoscience to scale 1: 250 000, the regional geology of the site and surrounds comprises the following mapping units in increasing stratigraphic order:

i. Two bodies of Jurassic Age intrusive dolerite;
ii. Shale (mudrock) of the Pietermaritzburg Formation, Ecca Group, Karoo Supergroup;
iii. Tillite / diamictite of the Dwyka Group;
iv. Sandstone and allied sedimentary rocks of the Natal Group; and

v. Gneiss and subordinate quartzite of the Natal Structural and Metamorphic Province.

Two geological faults aligned approximately north-south are inferred near the eastern site boundary.

An excerpt from the above referenced geological sheet is given below in Plate 8.

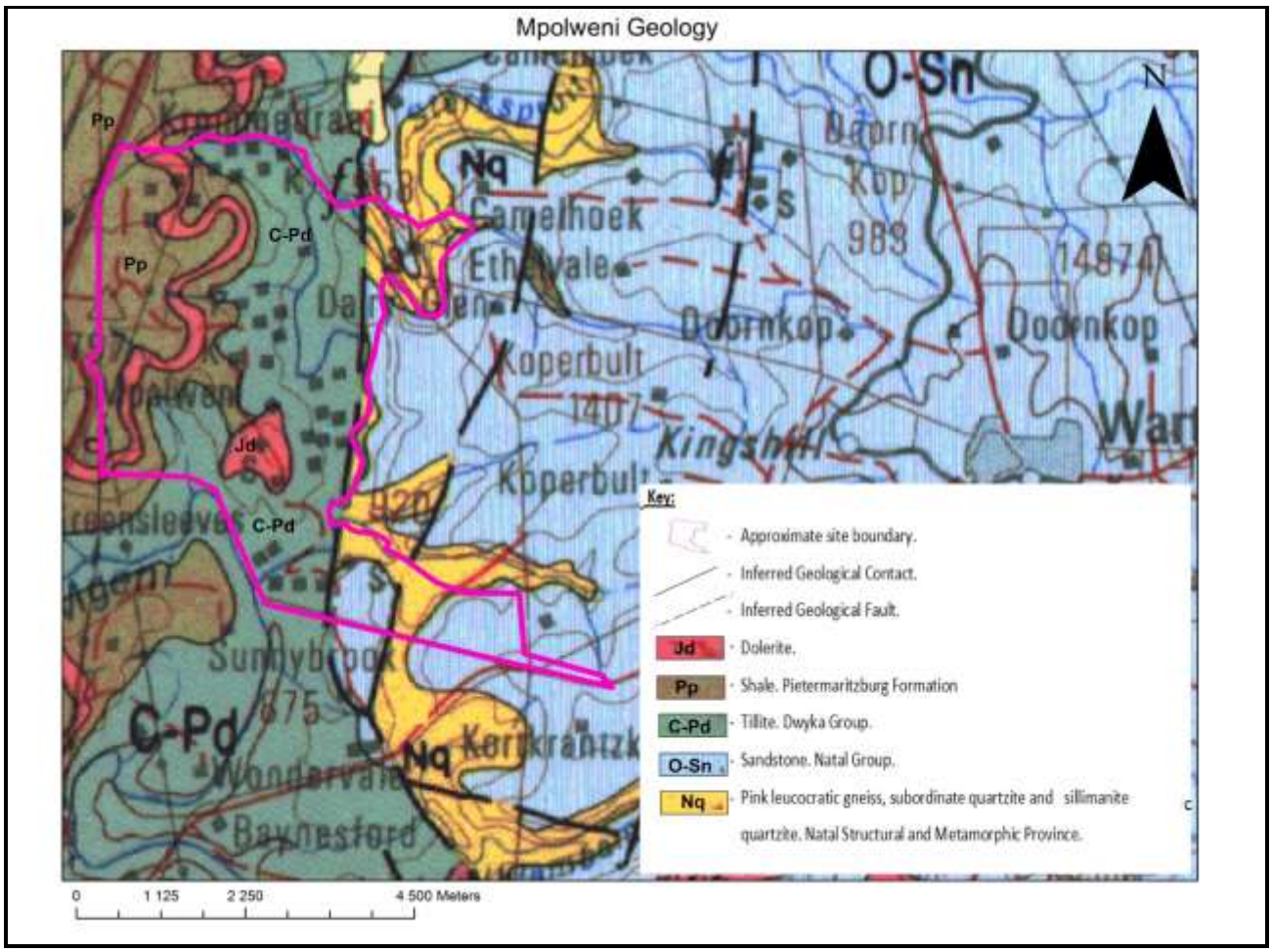

Plate 8: Regional geological map of the site and surrounds from *"2930 Durban"*, (Council for Geoscience, 1988)

8. INFERRED SUBSURFACE CONDITIONS

At the positions investigated, the site is observed to be underlain by the following geological units in increasing stratigraphic order:

i. Fill;
ii. Alluvium (waterborne deposits);
iii. Colluvium (fine hillwash);
iv. Ferricrete (pedigenic soils);
v. Residual (fully decomposed former rock) dolerite;
vi. Weathered dolerite rock;
vii. Residual shale;
viii. Weathered shale rock;
ix. Residual sandstone;
x. Weathered sandstone rock;

xi. Residual gneiss;
xii. Weathered gneiss rock.

Subsurface conditions and typical profiles observed along the proposed bulk and reticulation pipelines Elevated Tank and Reservoir sites, are referenced according to the proposed zones and summarised below in Section 11.2, Table 3 of this report.

Plate 9 to Plate 14 below show general ground profiles observed during the field investigation.

Plate 9: View of shale rock: IP25

Plate 10: View of sandstone rock: IP5

Plate 11: Indicative view of residual and weathered tillite rock

Plate 12: Indicative view of residual dolerite: IP31

Plate 13: Indicative view of residual gneiss: IP40

Plate 14: Indicative view of gneiss rock: EXP8

9. GROUNDWATER

Groundwater seepage activity was observed at IP9, IP15 and IP26.

Stream flows were noted along 2 No. drainage courses graded southwards and south-westwards in the western and southern portions of the site.

Depths and relative intensities of the observed perched groundwater condition are listed in Table 2 below.

Table 2: Pipeline and Reservoir for Mpolweni Water Supply Scheme – Depths and Relative Intensities of Observed Perched Groundwater

Position	Depth (m below EGL)	Relative Intensity
IP9	2.91	Slight
IP15	1.42	Slight to Moderate
IP26	2.30	Slight to Moderate

The presence of alluvium encountered at IP15, ferricrete encountered at IP27, IP33, IP40 and IP41, and deep residual dolerite shale and gneiss clayey / clay soils encountered at IP9, IP10, IP21, IP24, IP26, IP28, IP34, IP36, IP42, IP43 and IP56, to varying levels below EGL, and stained dolerite and shale rocks, are indicative of intermittent perched groundwater activity at these positions.

The risk of encountering surface or subsurface groundwater flows is also considered to increase towards any low-lying/weakly to poorly drained areas near drainage lines and/or geological contacts, at the positions shown in Figure 085-20.R01.001.

Conversely, the risk of encountering perched groundwater activity is generally assessed to decrease across satisfactorily drained and elevated portions of the site associated with hillside terrain where underlain by rock within depths of approximately 1m – 1.5m below EGL, such as the position of the proposed 3ML reservoir (IP4 to IP8 refer), IP20, IP22, IP29, IP57 and IP58.

Perched groundwater activity is most likely to occur during and after periods of sustained/high rainfall generally, intensifying where subject to the above topographical and geological controls.

10. LABORATORY TEST RESULTS

The following laboratory tests were carried out on soil and weathered rock samples retrieved during the field investigation from the site and from the Lethingcebo Quarry identified during the investigation:

i. Grading Analysis to 0.075mm sieve with Atterberg Limit Determinations;
ii. Modified AASHTO tests;
iii. California Bearing Ratio (CBR) tests;
iv. Hydrometer Analysis;
v. Soil Moisture Content; and
vi. Compactibility Factor.

Results of the laboratory tests above are given in Appendix C and summarised in Table 3.

Table 3: Pipeline and Reservoir for Mpolweni Water Supply Scheme - Summary of Results of Particle Size Distribution Analysis, Hydrometer, Atterberg Limit Determinations, Compactibility Factor, Insitu Moisture Contents and Materials Classification

IP	Depth (m)	Description	Particle Size %				Atterberg Limits %			OMC (%)	GM	MDD kg/m^3	CBR Values			Swell %	IMC	CF	Material Code & Classification
			Clay	Silt	Sand	Gravel	LL	PI	LS				Compaction MDD %						
													90	93	95				
COLLUVIUM																			
IP5	0.01 – 0.38	Medium brownish grey slightly clayey SAND	8	10	75	7	SP	SP	0.5	7.5	1.22	2061	12	21	31	0.1	3.9	-	A-2-4 (0) SM G8 G6# *Low
WEATHERED DOLERITE ROCK																			
IP14	0.74 – 1.62	Dark bluish grey stained, highly weathered, very soft rock	17	13	14	56	44	14	7.0	9.0	1.88	1979	8.4	12	16	1.0	8.4	-	A-2-7 (1) GM G9 G8# *Low
IP39	0.24 – 1.00	Dark bluish grey stained, highly weathered, very soft rock	5	7	14	74	31	12	7.0	9.6	2.42	2032	8.8	14	19	0.4	9.7	-	A-2-6 (0) GC G9 G8# *Low
RESIDUAL GNEISS (LETHINGCEBO QUARRY)																			
Quarry	0.0 – 0.5	Light orange brown, gravelly silty SAND to SANDY GRAVEL	2	7	44	47	SP	SP	0.5	7.5	2.09	2147	20	29	37	0.1	4.1	0.633	A-1-b (0) SW-SM G6 G6# *Low
WEATHERED SANDSTONE ROCK																			
IP4	0.60 – 0.90	Light greyish orange, highly weathered, very soft rock	4	7	80	9	NP	NP	0.0	8.0	1.49	2008	14	22	30	0.0	3.9	-	A-1-b (0) SM G7 G6# *Low
IP20	0.54 – 1.30	Light purplish grey, highly weathered, very soft rock	4	7	80	9	NP	NP	0.0	6.4	1.62	1995	13	21	29	0.1	6.3	-	A-1-b (0) GM G7 G6# *Low

LL	-	Liquid Limit	A-2-4 (90	-	Revised US Classification	CF	-	Compactibility Factor
PI	-	Plasticity Index	LS	-	Linear Shrinkage	GM	-	Grading Modulus
SC	-	Unified Classification	-		Not Tested	*Low	-	Potential Expansiveness (van der Merwe, 1964)
G7	-	Classification in terms of TRH14 (1985)	G6#	-	Classification in terms of COLTO (1998)	IMC	-	Insitu Moisture Content

11. DISCUSSION

11.1 Proposed Development

It is understood from information confirmed with Geosure that the proposed development is to comprise the following:

i. Approximately 170km of reticulation pipeline (combination of HDPE, uPVC and steel pipelines) including 20km of bulk pipeline;

ii. Invert levels shall not exceed 2m below EGL, unless there are special circumstances or obstacles;

iii. One Reinforced Concrete (RC) 3ML reservoir, comprising a 20mm thick RC slab, thickening beneath the external columns, established on 100mm no-fines blanket layer with 75mm diameter subsoil pipes formed on a damp proof course, 150mm G5 compacted layer, and existing insitu materials ripped and re-compacted. The reservoir is expected to be positioned above ground level with the floor slab on a level platform relative to natural ground level to ensure minimal earthworks. A peak design bearing pressure under the wall footing of 117kN/m² and maximum design bearing pressure under column footing of 135 kN/m² have been confirmed.

iv. One elevated 200kl Tank supported via 4 No. columns on a 5.88m x 5.00m x 0.70m deep base with a design bearing pressure (self weight and water) of 100kN/m² and maximum bearing pressure (working) under wind loading of 200kN/m².

11.2 Inferred Geological and Geotechnical Conditions along Proposed Pipeline Route

A summary of inferred excavation requirements, and general geological and other site conditions influencing construction are referenced according to the approximate footprints of the 13 No. site zones, namely, Zone 1, Zone 2A, Zone 2B, Zone 2C, Zone 3A, Zone 3B, Zone 3C, Zone 3D, Zone 3D-1, Zone 3D-2, Zone 4A, Zone 4B and Zone 4C, shown in Table 4, overleaf.

Table 4: Pipelines, Reservoir and Elevated Tank for Mpolweni Water Supply Scheme - Summary of Site Descriptions, Field Tests, Geological and Trenchability Conditions Inferred along the Pipeline Route and Reservoirs

Field Tests	Depth Range and (Position) (m below EGL)	Abbreviated Inferred Profile	Depth to Rock (m below EGL)	Refusal Depth of Inspection Pits and (DCPs/ DPLs) (m below EGL)	Observed Groundwater Seepage (m below EGL)	Depth (m below EGL)	Inferred Trenchability (Excavation Classes in terms of SANS 1200D)	Comments
ZONE 1: PROPOSED 200KL ELEVATED TANK & PIPELINES								
IP1 to IP3; IP11; DC1 to DC3; DC11; DPL1; DPL2	0.0 – 0.86/1.30/2.00 (IP1 – IP3)	Dark reddish brown / light yellowish brown, loose to medium dense, clayey SAND and gravelly clayey SAND with large fragments of shale rock plastic wire and cloth - *Fill*	0.87	>3.5 (>3.5; 3.9 – 4.8)	None	0 – 3.5	SOFT with allowance for BOULDER CLASS B	i. Uncontrolled fill with particle contamination observed at positions profiled at site for proposed elevated tank to depths in the range 0.8m to 2.0m below EGL. ii. Soil cover considered susceptible to erosion by uncontrolled surface water flows. iii. Potentially unstable sidewall conditions anticipated. iv. An allowance should be made for BOULDER CLASS B excavation due to presence of rock fragments. v. Geological variations may result in INTERMEDIATE to HARD excavation classes at shallower depth. vi. Potential for intermittent shallow perched groundwater activity. vii. Potentially active and compressible clay founding conditions of low bearing capacity within soil cover
	0.0 - 0.76 (IP11)	Medium brownish grey, loose to medium dense, clayey SAND – *Colluvium*				>3.5	SOFT to INTERMEDIATE with allowance for BOULDER CLASS B	
	0.76 – 1.67 (IP11)	Light to medium reddish grey, firm to stiff, sandy CLAY with shale fragments – *Residual Shale*						
	1.67 – 3.50 (IP11)	Light bluish grey, highly weathered, highly fractured, very soft rock - *SHALE*						
ZONE 2A: PROPOSED PIPELINES								
IP9; IP10; IP22; IP23 DC9; DC10; DC22; DC23	0.0 – 1.34 (IP9)	Medium brown, loose to medium dense, clayey SAND / light yellowish brown, medium dense to dense, gravelly clayey SAND with fragments of shale rock - *FILL*	0.74/0.80	1.22 (IP22); 1.62 (IP23) (0.7 to 2.6)	None; One drainage line	0 – 0.7	SOFT with allowance for BOULDER CLASS B	i. Soil cover considered susceptible to erosion by uncontrolled surface water flows. ii. Potentially unstable sidewall conditions anticipated. viii. An allowance should be made for BOULDER CLASS B excavation due to presence of rock fragments. iii. Loosely consolidated and weakly cohesive sandy Fill exhibits collapse settlement potential. iv. Geological variations may result in INTERMEDIATE to HARD excavation classes at shallower depths v. Potential for intermittent shallow perched groundwater activity.
	0.0– 0.28/0.39/ 0.48 (IP10; IP22; IP23)	Medium brown, loose to medium dense, slightly clayey SAND/ medium brownish grey, firm to stiff, sandy CLAY - *Colluvium*						
	0.28 – 0.74/0.80 (IP9; IP10; IP22; IP23)	Medium brownish orange, firm to stiff, sandy CLAY/dark reddish brown, sandy silty CLAY – *Residual Shale*						
	0.74– 1.22/1.62 (IP22; IP23)	Dark bluish grey stained, highly weathered, highly fractured, very soft rock - *SHALE*				>0.7	SOFT to INTERMEDIATE with allowance for BOULDER CLASS B	

Field Tests	Depth Range and (Position) (m below EGL)	Abbreviated Inferred Profile	Depth to Rock (m below EGL)	Refusal Depth of Inspection Pits and (DCPs/ DPLs) (m below EGL)	Observed Groundwater Seepage (m below EGL)	Depth (m below EGL)	Inferred Trenchability (Excavation Classes in terms of SANS 1200D)	Comments
ZONE 2B: PROPOSED PIPELINES								
IP21 DC21	0.0 – 0.64	Medium brownish red, loose, silty SAND with plastic - *FILL*	> 3.50	> 3.50 (> 3.50)	None	0 – 3.5	SOFT with allowance for BOULDER CLASS B	i. Soil cover considered susceptible to erosion by uncontrolled surface water flows. ii. Potentially unstable sidewall condition anticipated. iii. An allowance should be made for BOULDER CLASS B excavation to cater for risk of hard boulder size corestones associated with residual dolerite. iv. Geological variations may result in INTERMEDIATE to HARD excavation classes at shallower depths. v. Loosely consolidated and weakly cohesive sandy Fill exhibits collapse settlement potential. vi. Potential for intermittent shallow perched groundwater activity.
	0.64 – 3.50	Dark reddish orange, firm to stiff, silty sandy CLAY – *Residual Dolerite*						
ZONE 2C; ZONE 3D-2; ZONE 4A: PROPOSED PIPELINES (Broadly Variable Subsurface Conditions Anticipated)								
IP24; IP26 – IP28; IP33; IP34; IP40 – IP45; EXP4 – EXP8 DC24; DC26 – DC28; DC33; DC40 – DC45	0.0 – 0.34 (IP28)	Medium brownish yellow, medium dense, gravelly clayey SAND – *Fill*	0.0/0.3/0.5/0.6/ 0.7/1.4/1.5/1.7/ 1.8/2.0	0.80 - >3.50 (0.4 – >3.5)	2.3 (IP26) 4 No. drainage lines	0 – 1.0	SOFT to INTERMEDIATE with allowance for BOULDER CLASS B	i. Soil cover considered susceptible to erosion by uncontrolled surface water flows ii. Potentially unstable sidewall condition anticipated. iii. While not observed during the field investigation, hard boulder size corestones are known to be associated with residual tillite/weathered tillite on sites elsewhere. An allowance should therefore be made for BOULDER CLASS B excavation. iv. Loosely consolidated fill and colluvium assessed to exhibit collapse settlement potential. v. Geological variations may result in INTERMEDIATE to HARD excavation classes at shallower depths vi. Potential for intermittent shallow perched groundwater activity
	0.0- 0.34/0.40/0.50/ 0.94 (IP26; IP27; IP33; IP40; IP41)	Dark brown, firm, sandy CLAY – *Colluvium* (IP26) Medium brown, loose to medium dense, slightly clayey SAND with roots – *Colluvium* (IP27; IP33) Light grey, loose, silty SAND – *Colluvium* (IP41)						
	0.0 – 3.5 (IP24; IP26; IP28; IP35)	Dark reddish brown / medium orange red / dark grey mottled, firm to stiff, sandy CLAY / dark reddish orange, silty sandy CLAY – *Residual tillite*				>1.0	INTEMEDIATE with allowance for HARD and BOULDER CLASS B	
	0 – 0.46/0.60 (IP44; IP45)	Light pinkish grey, loose to medium dense, slightly clayey SAND – *Residual sandstone*						
	0.34-1.24 (IP27) 0.40 – 1.24 (IP40; IP41)	Light yellowish orange mottled, dense, gravelly SAND – *Ferricrete* Light grey stained, dense, silty sandy GRAVEL – *Ferricrete*						
	0.0 – 0.25/3.50 (IP34; IP40; IP42; IP43; EXP7)	Dark red, firm to stiff, silty sandy CLAY / silty gravelly sandy CLAY – *Residual gneiss* (IP34; IP42; IP43; EXP7) Light yellow, medium dense, gravelly clayey SAND – *Residual gneiss* (IP40)						

Field Tests	Depth Range and (Position) (m below EGL)	Abbreviated Inferred Profile	Depth to Rock (m below EGL)	Refusal Depth of Inspection Pits and (DCPs/ DPLs) (m below EGL)	Observed Groundwater Seepage (m below EGL)	Depth (m below EGL)	Inferred Trenchability (Excavation Classes in terms of SANS 1200D)	Comments
	1.24 – 2.24 (IP27)	Light yellowish orange stained, highly weathered, highly fractured, very soft rock – *TILLITE*						
	0.0 – 0.28/0.80/0.84/ 1.45/1.65 (IP44; IP45; EXP4-EXP6)	Light purplish pink, highly weathered, highly fractured, very soft rock – *SANDSTONE*						
	0.0- 0.64/2.1 (EXP7; EXP8)	Light yellowish orange, highly to moderately weathered, moderately to highly fractured, very soft rock – *GNEISS*						
ZONE 3A: PROPOSED 3ML RESERVOIR & PROPOSED PIPELINES (Broadly Variable Subsurface Conditions Anticipated)								
IP16 – IP20; IP46 – IP58; EXP1; EXP9; EXP10 DC16 – DC20; DC46– DC58	0.00-0.54 (IP20)	Medium brownish orange, medium dense, slightly clayey SAND with pieces of asphalt – *Fill*	0.0/0.2/0.48/0.5 /0.6/0.7/0.8/1.1 /1.5/1.7/1.8/2.0	0.6 – >3.5 (0.2 – 2.6)	None 2 No. drainage lines	0 – 1.0	SOFT to INTERMEDIATE with allowance for BOULDER CLASS B	i. Soil cover considered susceptible to erosion by uncontrolled surface water flows ii. Potentially unstable sidewall condition anticipated. iii. An allowance should be made for BOULDER CLASS B excavation to cater for hard boulder size dropstones associated with residual tillite / weathered tillite. iv. Loosely consolidated fill, colluvium and residual sandstone assessed to exhibit collapse settlement potential. v. Geological variations may result in INTERMEDIATE to HARD excavation classes at shallower depths. vi. Potential for intermittent shallow perched groundwater activity, and river/stream flow observed near IP16. vii. Levels to very rock sandstone at site for 3ML Reservoir observed to range from 0.5m to 0.7m below EGL.
	0.0 - 0.20/0.34/0.41/ 0.42/0.42/0.48/ 0.54/0.61/0.68 (IP4 – IP8;IP16; IP17; IP18; IP46; IP47; IP51-IP53; IP56-IP58)	Medium brown, loose to medium dense, slightly clayey SAND with roots – *Colluvium* (IP5; IP16; IP18; IP46; IP50; IP51-IP53) Medium brown, loose, silty SAND – *Colluvium* (IP4; IP6-IP8;IP17; IP47; IP56-IP58)						
	0.42-0.62 (IP16)	Dark reddish brown / dark medium brownish yellow / dark grey mottled, firm to stiff, sandy CLAY / dark reddish orange, silty sandy CLAY – *Residual tillite*				>1.0	INTEMEDIATE with allowance for HARD and BOULDER CLASS B	
	0.0- 0.5/0.64/0.71/ 0.8/1.05/1.1/1.54/ 1.68/1.84/2.0/3.5 (IP18; IP19; IP47-IP56; IP58)	Medium orange brown / medium reddish brown, loose to medium dense, slightly clayey SAND and silty SAND with sandstone rock fragments – *Residual sandstone*						
	0.0 – 1.1/1.34/1.48 IP16; IP46; EXP1)	Dark bluish grey stained / Light yellowish orange stained, highly weathered, highly fractured, very soft rock containing subrounded hard dropstones and corestones – *TILLITE*						

Field Tests	Depth Range and (Position) (m below EGL)	Abbreviated Inferred Profile	Depth to Rock (m below EGL)	Refusal Depth of Inspection Pits and (DCPs/ DPLs) (m below EGL)	Observed Groundwater Seepage (m below EGL)	Depth (m below EGL)	Inferred Trenchability (Excavation Classes in terms of SANS 1200D)	Comments
	0.0 – 0.24/0.48/ 0.55/0.9/1.1/ 1.2/1.3/1.46/ 2.12/2.24/2.6 (IP17-IP20; IP47-IP55; IP57; IP58; EXP9; EXP10)	Light pinkish grey, highly weathered, highly fractured, very soft rock – *SANDSTONE*						
ZONE 3B; ZONE 3C; ZONE 3D; ZONE 3D-1; ZONE 4C; ZONE 4B: PROPOSED PIPELINES (Broadly Variable Subsurface Conditions Anticipated)								
IP11 – IP15; IP29 – IP32; IP36 – IP39 DC11 – DC15; DC29 – DC32; DC36 – DC39	0.00-0.54/0.79/087 (IP12; IP13; IP36)	Medium brownish orange and brownish grey, loose to medium dense, slightly gravelly clayey SAND and slightly clayey SAND with pieces of plastic – *Fill*	0.2/0.6/0.8/0.9/ 1.1/1.5/1.7/1.8	1.0 – >3.5 (0.4 – >3.5)	1.4 (IP15) 6 No. drainage lines	0 – 0.9	SOFT to INTERMEDIATE with allowance for BOULDER CLASS B	i. Soil cover considered susceptible to erosion by uncontrolled surface water flows ii. Potentially unstable sidewall condition anticipated. iii. An allowance should be made for BOULDER CLASS B excavation to cater potentially for hard boulder size dropstones associated with residual tillite / weathered tillite and corestones in residual dolerite / weathered dolerite rock. iv. Loosely consolidated fill, alluvium, and colluvium assessed to exhibit collapse settlement potential. v. Geological variations may result in INTERMEDIATE to HARD excavation classes at shallower depths. vi. Potential for intermittent shallow perched groundwater activity, and river/stream flow observed near IP15. viii. Levels to very rock sandstone at site for 3ML Reservoir observed to range from 0.5m to 0.7m below EGL.
	0.0 – 1.42 (IP15)	Light orange brown, loose, silty SAND – *Alluvium*						
	0.0 - 0.24/0.34/0.42/ 0.46/0.61/0.74/ 0.76	Medium brown and medium brownish grey, loose to medium dense, clayey SAND – *Colluvium* (IP11; IP31; IP32; IP37-IP39) Medium brownish red, firm to stiff, sandy CLAY – *Colluvium* (IP29; IP30)						
	0.42-3.50 (IP31; IP36)	Dark red and dark reddish orange mottled, firm to stiff, sandy silty CLAY – *Residual dolerite*				>0.9	INTEMEDIATE with allowance for HARD and BOULDER CLASS B	
	0.34 – 1.84 (IP11; IP29; IP30; IP32; IP38)	Light to medium reddish grey brownish red and dark red, firm to stiff, sandy CLAY with shale fragments – *Residual Shale*						
	0.79 – 3.50 (IP11-IP13; IP29-IP32; IP38)	Light bluish grey stained, highly weathered, highly fractured, very soft rock - *SHALE*						
	0.00-0.74 (IP14; IP16)	Dark reddish brown / dark medium brownish yellow / dark grey mottled, firm to stiff, sandy CLAY / dark reddish orange, silty sandy CLAY – *Residual tillite*						

Field Tests	Depth Range and (Position) (m below EGL)	Abbreviated Inferred Profile	Depth to Rock (m below EGL)	Refusal Depth of Inspection Pits and (DCPs/ DPLs) (m below EGL)	Observed Groundwater Seepage (m below EGL)	Depth (m below EGL)	Inferred Trenchability (Excavation Classes in terms of SANS 1200D)	Comments
	0.24-2.17 (IP16; IP39)	Dark bluish grey stained / Light yellowish orange stained, highly weathered, highly fractured, very soft rock – *TILLITE*						

11.3 General Stability

Based on the results of the current field investigation, it is considered that the site appears to be generally stable and suitable for the proposed development, provided the recommendations given below in Sections 11.4 to 11.11 of this report are adhered to. Measures amount to no more than sound development controls appropriate to the site conditions inferred and the development proposals confirmed with Geosure at the time of reporting.

11.4 General Earthworks at Sites for Reservoir and Elevated Tank

Information received by Geosure indicates that the reservoir and elevated tank are likely to be constructed above ground level with the floor slab on a level platform relative to natural ground level to ensure minimal earthworks.

It is recommended that all earthworks be carried out in accordance with SANS 1200D (current version).

The inferred excavation requirements at the proposed reservoir site have been appraised according to the guidelines provided in SANS 1200D and summarised in Section 11.2, Table 4, above.

As a guide, temporary batters for any proposed cuts at the reservoir and elevated tank sites should be restricted to the following:

i. **Soils including Fill** - 1 (vertical): 2 (horizontal) i.e. ≤ 26°, limited to a height / depth of approximately 1.5m from EGL.

ii. **Weathered Shale / Tillite/ Sandstone / Gneiss Rocks** - 1 (vertical): 1 (horizontal) i.e. ≤ 45°, limited to a depth / height of approximately 2m from EGL. Should planes of weakness formed along either the bedding and / or fracture surfaces be exposed during excavations, it is recommended that a geotechnical specialist, such as Geosure, be appointed to assess the effects thereof on both the stability of the cutting and the overall global stability of the slope.

Workers should not enter any excavations deeper than 1.5m that are not shored or battered back as described above. All excavations are to be inspected on a daily basis by a competent person to confirm stability. These inspections should be formally documented. It remains the responsibility of the contractor, however, to ensure compliance with the current Occupational Health and Safety Act and Construction Regulations (Google Earth, 2019).

11.5 Trench Stability

It is considered that trenches excavated in the soil cover encountered during the fieldwork should be regarded as potentially unstable and will require lateral support to engineer's detail or battering of slopes to stable temporary angles, as will trenches excavated in areas with groundwater seepage, if encountered. Trenches deeper than 1.5m should be shored in any event, particularly if left open indefinitely.

As a guide, temporary side slopes of trench excavations should be restricted to the following:

i. **Fill and colluvial / alluvial soils** – 1v:1h to a depth of 2m. For greater depths up to 3m, batters should be formed to 1v:2h (≤ 26°) provided there is no groundwater seepage. If seepage is observed, then trenches will need to be temporarily shored to engineer's detail.

ii. **Residual clay / silt / ferricrete soils** – 1v:0.5h (≤ 63°); for excavations to a depth of 1.5m, for depths up to 3m, batter to 1v:2h (≤ 26°).

iii. **Highly to moderately weathered, tightly jointed rock** – 1v:0.5h (≤ 63°), provided that either no day-lighting bedding planes or planes of weakness such as clay gouge are visible.

iv. **Unweathered to slightly weathered, tightly jointed rock, if present** – Vertical, if either no day-lighting bedding planes or planes of weakness such as clay gouge is visible.

It is recommended that excavations be carried out in the dry season as far as possible and backfilled with the minimum of delay.

It is recommended that both the geotechnical professional and contractor carry out regular documented inspections of the trenches in order to detect unstable sidewall conditions during the construction phase.

Trenches should be temporarily shored to Engineer's detail in all situations where groundwater is encountered or instability is observed.

Workers should not enter or work below any excavations/cuts deeper than 1.5m that is not shored or battered back as described above. It remains the responsibility of the contractor, however, to fully comply with the requirements of the current Occupational Health and Safety (OHS) Act.

11.6 Inferred Subsurface Conditions and Trenchability Assessment along the Proposed Pipelines

The inferred excavation requirements within the zones indicated in Figure 085-20.R01.001 have been appraised according to the guidelines provided in SANS 1200D and summarised in Section 11.2, Table 4, above.

In areas where soils and highly "very soft" rock are encountered at the pipe invert design levels, excavations to these levels should be relatively easy, in terms of hardness, to achieve using light earthmoving equipment. In this regard, excavations down to inferred depths in the range 0.7m to at least 3.5m below EGL are classified as either SOFT or Soft to INTERMEDIATE, with allowance for BOULDER CLASS B in terms of SANS 1200D.

In any areas where "soft" rock, with limited fractures and / or frequent boulders are encountered, it is anticipated that an excavation class of INTERMEDIATE suited to a 20 tonne or 30 tonne tracked excavator and/or pneumatic tools should be allowed for the necessary depths to be achieved.

Limited blasting may be required in areas if either "medium hard", "hard", "very hard" or "extremely hard" rock, which are considered to classify as HARD in terms of SANS 1200D, is encountered.

In the event that blasting is carried out, the difficulties, disruption and safety issues surrounding a blasting programme, as well as damage that may occur to adjacent structures will need to be considered.

A risk of perched groundwater activity has been inferred intermittently for the site, especially in the vicinity of the numerous drainage courses shown in Figure 085-20.R01.001 and quantified in Section 11.2, Table 4. Generally, the risk is inferred to increase near any low-lying/weakly drained areas and be exacerbated during and after rains / late spring and summer. Where groundwater activity is encountered, trenches/excavations are considered prone to rapid sidewall collapse, as well as flooding of excavations. Excavation rates within areas with the above features are likely to variable, furthermore, shoring and temporary dewatering of excavations to engineer's detail is likely to be required in order to allow for practical and safe working conditions.

11.7 Materials Evaluation and Pipe Bedding

It is understood that the proposed bulk pipeline, at least, and potentially also the reticulation pipelines, require a bedding cradle of "*Selected Granular Material / Bedding Material*", a fill blanket of "*Select Fill*" (only for the bulk pipeline), and thereafter a "*Main Fill*" as defined by SANS 1200 LB (1983) and the specification given in the document referenced in Item i, Section 4, above.

Select Granular Material is defined as "granular, non-cohesive and singularly graded between 0.6 and 19mm. The material must be free draining and have a compactability factor not exceeding 0.4". Furthermore, specification referenced above provides additional requirements in terms of grading (based on percentage passing specific particle size range), absence of organic material, stiffness ratio of less than 5.0MPa, and preference for river transported material.

Select Fill is defined as "a material with a Plasticity Index (PI) not exceeding 6, free from lumps, vegetation and stones of a diameter exceeding 30mm".

Main Fill is the approved filling material placed in a pipe trench after the pipe has been laid and surrounded by a layer of selected fill blanket. It generally comprises the material removed from the pipe trench during excavation.

11.7.1 Evaluation of Insitu Materials for Use in Construction of Pipelines

The following general evaluation is made regarding the inferred suitability of the in-situ materials for use in the construction of the pipeline based upon the laboratory test results summarised above in Section 10, Table 3, and included in full as Appendix D:

i. The materials tested from the site are considered unsuitable for use as *"Selected Granular Material"*. In general, it is considered that bedding material meeting the above requirements will need to be imported to the site.

ii. The insitu materials encountered on site are considered unlikely to meet the *"Selected Fill"* requirements due to the plasticity indices of the material tested exceeding a value

of 6. However, these materials can be utilised for *"Main Fill"* requirements over the select fill.

iii. Caution should be exercised when using clayey materials such as colluvium and residuum soils as these are moisture-sensitive and will heave and will be difficult to compact when wet. These materials may also require a long time to dry out and it may not be economically feasible to wait for such in which case material should be spoiled and replaced with a granular backfill.

From experience, the *Selected Granular Material* requirements in terms of SANS 1200 LB (1983) and are seldom met by natural soils. The very strict grading requirements generally only coincide with specially designed, blended sands and gravels. Furthermore, the natural variability in composition within the in-situ materials will make the establishment of a consistent quality very difficult. This could be problematic where the bedding is relied upon for foundation support and additional hoop strength (where required) in the design of pipelines.

11.7.2 Evaluation of Insitu Materials for Use in Construction of Reservoir and Elevated Tank

A general assessment of materials encountered on site for use in the construction of any fills for bulk earthworks to the proposed reservoir and elevated tank has been based on the visual assessment made on site and laboratory test results.

The characteristics of the materials and their suitability for use in construction are summarised below in Table 5.

Table 5: Pipelines and Reservoir for Mpolweni Water Supply Scheme - Classification of Materials and Recommendations for Usage

Material Description	USC (TRH14) ((COLTO))	Remarks on Usage
FILL (UNCONTROLLED)		
Dark reddish brown / light yellowish brown, clayey SAND and gravelly clayey SAND with large fragments of shale rock, plastic wire and cloth Medium brown, clayey SAND / light yellowish brown, gravelly clayey SAND with rock fragments Medium brownish red, silty SAND with plastic Medium brownish orange, clayey SAND with asphalt Medium brownish orange and brownish grey, gravelly clayey SAND and clayey SAND with plastic	Not Tested (Not Tested) ((Not Tested))	i. Considered poor subgrade material in terms of TRH14 (Commitee of State Road Authorities, 1985) due to particle contamination ii. Will generally require undercutting and replacement with a suitable select granular soil where encountered at or below subgrade level iii. Not considered suitable for use as select fill or general due to the clay nature and particle contamination

Material Description	USC (TRH14) ((COLTO))	Remarks on Usage
COLLUVIUM		
Medium brownish grey, clayey SAND	SM (G8) ((G6#))	i. Not considered suitable for use as select fill or general fill due to the likelihood of organic content and clay nature ii. Will require undercutting and replacement with a suitable select granular soil where encountered at or below subgrade level iii. Consideration should be given to stockpiling this material for use as topsoil
Medium brown, clayey SAND/ medium brownish grey, sandy CLAY Dark brown, sandy CLAY Medium and dark brownish grey, clayey SAND Light grey / medium brown, silty SAND Medium brownish red, sandy CLAY	Not Tested (Not Tested) ((Not Tested))	
ALLUVIUM		
Light orange brown, loose, silty SAND	Not Tested (Not Tested) ((Not Tested))	i. Considered suitable for use as select fill and general fill subject to laboratory verification testing
FERRICRETE		
Light yellowish orange mottled, gravelly SAND Light grey stained, silty sandy GRAVEL	Not Tested (Not Tested) ((Not Tested))	i. Limited volumes anticipated ii. Considered suitable for use as select fill and general fill subject to laboratory verification testing
RESIDUAL DOLERITE		
Dark red and dark reddish orange mottled, sandy silty CLAY, with possible corestone boulder inclusions	Not Tested (Not Tested) ((Not Tested))	i. Considered poor to adverse quality subgrade material (including potential saprolyte) in terms of TRH14 (Commitee of State Road Authorities, 1985) ii. Not considered suitable for use as select or general fill due to the clayey nature identified during fieldwork iii. Will require undercutting and replacement with a suitable select granular soil where encountered at or below subgrade level

Material Description	USC (TRH14) ((COLTO))	Remarks on Usage
WEATHERED DOLERITE ROCK		
Dark bluish grey stained, highly weathered, very soft rock	GM; GC (G9) ((G8#))	i. Materials classify as good to excellent quality subgrade material in terms of TRH14 ii. Suitable for use as general fill iii. Unsuitable for use select fill subject to verification by laboratory testing and protection against rapid deterioration on exposure to elements; iv. Unsuitable materials will require undercutting and replacement with a suitable select granular soil where encountered at or below subgrade level
RESIDUAL SHALE		
Light to medium reddish grey, sandy CLAY with shale fragments Medium brownish orange, sandy CLAY/dark reddish brown, sandy silty CLAY Light to medium reddish grey brownish red and dark red, sandy CLAY with shale fragments	Not Tested (Not Tested) ((Not Tested))	i. Considered poor to adverse quality subgrade material (including potential saprolyte) in terms of TRH14 ii. Not considered suitable for use as select or general fill due to the clayey nature identified during fieldwork iii. Will require undercutting and replacement with a suitable select granular soil where encountered at or below subgrade level
WEATHERED SHALE ROCK		
Light and dark bluish grey stained, highly weathered, highly fractured, very soft rock	Not Tested (Not Tested) ((Not Tested))	i. Materials inferred to classify as marginal to poor quality subgrade material in terms of TRH14 (Commitee of State Road Authorities, 1985) ii. Suitable for use as general fill subject to removal of large rock fragments iii. Unsuitable for use select fill subject to verification by laboratory testing iv. Unsuitable materials will require undercutting and replacement with a suitable select granular soil where encountered at or below subgrade level

Material Description	USC (TRH14) ((COLTO))	Remarks on Usage
RESIDUAL SANDSTONE		
Medium orange brown / medium reddish brown, slightly clayey SAND and silty SAND with sandstone rock fragments	Not Tested (Not Tested) ((Not Tested))	i. Materials inferred to classify as fair to good quality subgrade and select fill materials in terms of TRH14, subject to laboratory verification testing ii. Suitable for use as general fill subject to removal of large rock fragments iii. Unsuitable materials will require undercutting and replacement with a suitable select granular soil where encountered at or below subgrade level
WEATHERED SANDSTONE ROCK		
Light greyish orange / purplish pink, highly weathered, very soft rock	SM; GM (G7) ((G6#))	i. Materials classify as fair to excellent quality subgrade and select fill materials in terms of TRH14 ii. Suitable for use as general fill subject to removal of large rock fragments
RESIDUAL GNEISS (from Lethingcebo Quarry)		
Light orange brown, gravelly silty SAND to SANDY GRAVEL	SW-SM (G6) ((G6#))	i. Materials classify as fair to excellent quality subgrade and select fill materials in terms of TRH14 ii. Suitable for use as general fill subject to removal of any large rock fragments
WEATHERED GNEISS ROCK		
Light yellowish orange, highly to moderately weathered, moderately to highly fractured, very soft rock	Not Tested (Not Tested) ((Not Tested))	i. Materials inferred to classify as fair to excellent quality subgrade and select fill materials in terms of TRH14, subject to laboratory verification testing ii. Suitable for use as general fill subject to removal of large rock fragments

The classification of materials on the site should be confirmed by laboratory testing to be undertaken during construction, as part of process and acceptance control monitoring, prior to the material being considered for use in construction.

11.7.3 Evaluation of Potential Commercial Material Sources

A potential source of construction materials, Lethingcebo Quarry, was identified in the north-eastern portion of the site.

The type of material available and comment on suitability for usage during construction is given in Table 6 below.

Table 6: Proposed Mpolweni Water Supply Scheme – Summary of Potential Material Source, Location, Material Available and Comment on Suitability of Material for Use in Construction in Terms of TRH14, SANS1200LB and the Umgeni Water Particular Amendments to SANS1200LB Bedding Specification

Source	Geological Unit	Unified Classification	TRH14 Classification (COLTO)	General Comments and Comment on Suitability for Use During Construction
Lethingcebo Quarry, Mpolweni	Silty SAND (Residual Gneiss)	A-1-b (0) SW-SM	G6 (G6#)	i. Sample tested is not suitable for use as "Select Granular Material" in terms of SANS1200LB ii. Sample tested is suitable for use as "Selected Fill" in terms of SANS1200LB iii. This material may also meet the above referenced requirements for use as "Select Granular Material" with careful design, screening and blend in order to achieve the relevant grading analysis range, subject to laboratory verification.

11.8 Backfill and Erosion Aspects

Areas underlain by fill, transported deposits (colluvium) and residual soils are generally susceptible to erosion due to uncontrolled runoff. The pipe trench line can also become a route for on-going erosion, and with time could develop into erosion features (dongas) with resultant failure of the proposed pipeline.

Where the pipelines are formed perpendicular to contours, over gradients steeper than about 1v:6h (> 9°), it is recommended that at intervals of every 3m to 5m, a section of the backfill be stabilised with cement or lime (about 4% by mass). The section of stabilised soil should be about 1m to 2m in length. It is also recommended that a grass cover be reinstated as soon as possible over the trench in order to prevent erosion.

Consideration can also be given to using geotextiles to help with the prevention of erosion especially along the steep approaches along drainage lines.

Compaction of the general backfill soils in trenches over the bedding layer and select fill should be carried out in layers of maximum loose thickness 200mm (depending on capability of compaction equipment) and compacted to minimum 90% of Modified AASHTO maximum dry density within 1 – 2 percent (wet/dry) of Optimum Moisture Content (OMC). This is critical to ensure that potential settlements over pipes and within the limits of the trench are kept to a minimum.

If soft and compressible clays and saturated soils are encountered during construction, these materials may require undercutting when exposed at or near formation level in the trench to improve working conditions.

11.9 Road and River / Stream Crossings

Information concerning the proposed design methodologies for stream / river and any road crossings was not confirmed with Geosure at the time of preparation of this report.

The inferred soil conditions, excavation conditions and groundwater conditions along the pipelines routes are given above in Section 11.2, Table 4.

Should pipe jackings be adopted for the proposed crossings of the streams / rivers / roads, it is critical that the design and construction follow guidelines set out in SANS 1200 LG (1983).

It is necessary to carry out the thrust and reception pits and pipe jack to the very best standards to ensure that railway lines and any underground services, if present, are unaffected by the pipe jacking and associated operations.

In particular, where pipes are to be jacked under fills, precautions must be taken to ensure that thrust and reception pits and the jacking operation do not in any way cause the slope face of fills to erode, slide, slump or move. Consideration should be given to introducing lateral support into the jacking pits and/or reception and thrust pits.

Settlement above the pipe is to be kept to a minimum. Both stormwater runoff and groundwater seepage is to be controlled during construction. In this regard, dewatering options will depend on the locations and depths of the trust and receptor pit works and should consider interceptor drains, or well points in extreme instances. In particular, surface drainage must be controlled to prevent runoff entering the jacking or reception pits and all pipe joints should be sealed to prevent groundwater seepage into the jacked pipes.

Backfilling of the thrust and reception pits and pipe trenches should be done using, where possible, *in situ* material, provided this material is not predominantly boulders or rock fragments and can be uniformly compacted to the required compaction. Final layers of backfilling should be raised above the natural ground level to compensate for long-term settlement and to prevent ponding of stormwater at the pit positions once settlement is complete.

The backfill in thrust and reception pits must be compacted to a minimum of 95% of Modified AASHTO maximum dry density throughout the full depth of the pits. Other fills should be compacted to a minimum of 93% of Modified AASHTO maximum dry density.

During the jacking operation, excavation must be such that overbreak is kept to a minimum.

Should the proposed crossings comprising trenching across existing roads, it is critical that the backfill of the trench and reinstatement of layerworks/surfacing be carried out to engineer's detail, the design of which should take into account insitu ground conditions, existing layerworks and design life of the road.

11.10 Inferred Founding Conditions and Foundation Recommendations for the Proposed 3ML Reservoir and 200KL Elevated Tank

Inferring from field data at the positions investigated to the inferred founding conditions and recommended foundation solutions for the proposed 3ML Reservoir and 200KL Elevated Tank are given in Table 7 and Table 8, overleaf.

Table 7: Proposed Mpolweni Water Supply Scheme – Summary of Inferred Founding Conditions and Foundation Recommendations for the Proposed 3ML Reservoir

3 ML Reservoir	Inferring for the inspection pit profiles IP4 to IP8, the inferred founding conditions at the site for the proposed 3ML Reservoir are characterised by the following: i. The occurrence of highly weathered sandstone, overlain by a soil mantle comprising generally sandy residuum and colluvium; ii. Observed depths to weathered sandstone rock range from approximately 0.54m (IP7 refers) to 0.68m (IP5 refers) below EGL; iii. Low bearing capacities of the residual and colluvial material encountered at shallow depths; iv. The potential for episodes of collapse settlement compression in response to increases in ground moisture content under constant applied load; and Low risk of an intermittent perched groundwater condition.	No foundations should be founded on the colluvial and/or residual soils at the site. Foundation loads are instead to be transferred onto competent weathered sandstone rock of at least "very soft" rock, equivalent to an unconfined compressive strength of at least approximately 2 MPA. For such founding media, a net allowable bearing pressure of approximately 250kN/m^2 is considered applicable. All footings should be embedded 0.3m 0 0.5m into approved sandstone rock, as verified during construction by the appointed geotechnical professional. Anticipated total settlements for footings supporting structural design pressures limited to 250kNm^2 that are founded onto approved sandstone rock of at least "very soft" strength, are not anticipated to exceed 5mm to 10mm, with differential settlement taken as 50% of total settlement. A geotechnical professional, such as Geosure, should be appointed to carry out regular inspections of foundation excavations during construction, in order to confirm bearing pressures and overall suitability of founding media. All loose or soft material must be removed from foundation excavations before concrete is cast. The surrounding ground should be graded away from structures to limit infiltration of water into the ground below floor level.

Table 8: Proposed Mpolweni Water Supply Scheme – Summary of Inferred Founding Conditions and Foundation Recommendations for the Proposed 200KL Elevated Tank

200 KL Elevated Tank	Inferring from inspection pit profiles IP1 to IP3, the inferred founding conditions at the site for the proposed 200KL Elevated Tank are characterised by the following: i. The occurrence of uncontrolled fill materials that were observed to comprise clayey SAND with frequent signs of particle contamination, to observed depths of between 0.86m and 2.00m below EGL. ii. The nature of the underlying weathered rock was not confirmed to the final depths of the inspection pit profiles and is inferred regionally to comprise either weathered shale or weathered dolerite. iii. Inferring from refusal depths of DPL1 and DPL2, weathered rock may occur at depths in the range 3.9m to 4.8m below EGL, respectively, however, refusal of the DPL may equally relate to the presence of isolated boulders in a soil matric and, as such, is not a reliable indicator of rock levels. iv. Relatively low bearing capacities of the fill / soil anticipated to depths of between approximately 3.9m and 4.5m below EGL; v. Risk of a saprolytic condition. Such a condition occurs in subgrade materials of low bulk densities and can result in collapse related settlements under applied load if the materials become wet up. vi. The potential that active colluvial and residual soils underlie the site that could result in excessive volumetric changes / differential movements in response to cyclical fluctuations in ground moisture content; and Risk of an intermittent perched groundwater condition.	Foundations are not to be formed directly on the insitu fill materials profiled and / or underlying soil cover. For the proposed structure with a maximum bearing pressure of 200kPa, provision may be made for the establishment of the reservoir foundation on structural fill / improved ground to geotechnical engineer's design detail. General guidelines with regards to an improved ground solution are presented below, as follows: i. Undercut and spoil all poorly consolidated soils from beneath foundation level to a level to be confirmed in a geotechnical design layout. All remnants of the existing reservoir foundation must be removed to spoil off site from the footprint of the structural fill. ii. Should the excavation intersect groundwater seepage, the excavation should then be backfilled with clean free draining sand to engineer's detail; iii. The excavation will need to be backfilled with imported select granular material to engineer's specification compacted to well above average compaction specification; iv. Installation of foundation may then proceed. Anticipated total settlements in response to an applied foundation pressures up to 150kN/m^2 are unlikely to exceed 10mm to 15mm, with differential settlement taken as 50% of total settlement. Actual settlements will vary proportionately to the sizing of the foundation as well as the confirmed foundation design load. The design of the ground improvement is to be carried out by an experienced geotechnical specialist such as Geosure. Furthermore, this option requires on-going process control/quality monitoring during construction.

11.11 Drainage

One of the critical factors in the stable development of the site is the control and removal of both surface and groundwater from the site, to engineer's detail.

Any loosely consolidated sandy and clayey / clay soils encountered during construction are considered susceptible to rapid and severe erosion by uncontrolled / channelled surface water runoff.

Earthworks and drainage measures are to be designed to prevent ponding of, or high concentrations of, stormwater or groundwater anywhere on the site, both during and after the development.

12. SUMMARY OF FINDINGS AND DEVELOPMENT RECOMMENDATIONS

This report details the results of a geotechnical investigation for the proposed Bulk and Reticulation Pipelines, 3ML Reservoir and 200KL Elevated Tank for the Mpolweni Water Supply Scheme, within uMshwati Local Municipality, mGungundlovu District Municipality, central Kwa-Zulu Natal.

The following observations, conclusions and recommendations are made to inform engineering design:

i. Based on the results of the field investigation and inferred ground conditions the site, it is considered that this site appears to be generally stable and suitable for development as proposed, provided the recommendations given in this report are adhered to.

ii. At the positions investigated, the site is observed to be underlain by shale of the Pietermaritzburg Formation, tillite of the Dwyka Group, Sandstone of the Natal Group, Gneiss of the Natal and Structural Metamorphic Province, and a capping of derived soil covers of clays clayey sands and clayey / silty gravels of varying thicknesses, including uncontrolled fill materials with particle contanination. Further details in this regard are set down in Section 8 of this report

iii. Groundwater seepage activity was observed at IP9, IP15 and IP26. Stream flows were also noted along 2 No. drainage courses in the western and southern portions of the site. A risk of intermittent perched groundwater activity has been identified for the greater majority of the site.

iv. The materials observed and tested are not considered suitable for use as "Selected Granular Material". Certain of the materials evaluated by laboratory testing are considered suitable for use as "Select Fill". Most of the materials investigated are considered generally suitable for use as "Main Fill". Further details in this regar are presented in Section 11.7.2, Table 5.

v. A potential commercial source has been identified at (Lethingcebo) Quarry in the north-eastern portion of the site, which may be able to supply material suitable for use as "Selected Fill" in terms of SANS1200LB, but is likely to require careful design, screening and blending in order to achieve the relevant grading analysis range.

vi. Recommendations for construction of the foundations to the proposed 3ML Reservoir on weathered rock and for the proposed 200KL Elevated Tank on structural fill, are given in Section 11.10, Table 7 and Table 7, of this report.

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 during subsequent supplementary investigation and/or elsewhere on site during construction. It is therefore important that Geosure be appointed to carry out periodic inspections during construction of the proposed development. Any change from the anticipated ground conditions can also be taken into account to avoid unnecessary expense.

The design of the proposed structural fill solution for the foundation to the 200KL Elevated Tank is to be carried out by an experienced geotechnical specialist such as Geosure, with allowance for on-going process control/quality monitoring during construction.

13. BIBLIOGRAPHY

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APPENDIX A

PROFILES OF INSPECTION PITS AND EXPOSURES

GEOSURE (Pty) Ltd
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Tel: (031) 266-0458
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Pile Integrity Testing & Civil Engineering Laboratory

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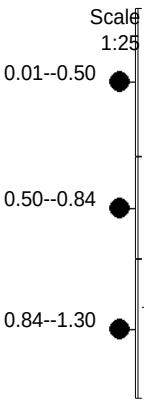
www.geosure.co.za

Escongweni BPH Engineers (Pty) Ltd
Proposed Water Supply Scheme at Mpolweni, KwaZulu-Natal within Umgungundlovu District Municipality

HOLE No: IP1
Sheet 1 of 1

JOB NUMBER: 085-20



0.00	Slightly moist, dark reddish brown, loose to medium dense, fine to medium grained, gravelly clayey SAND with large pieces of shale up to 0,40m in diameter. FILL.
0.50	
	Slightly moist, light yellowish brown, loose to medium dense, fine to medium grained, gravelly clayey SAND. FILL.
0.84	
	Slightly moist to moist, dark reddish brown, medium dense, fine to medium grained, clayey SAND. FILL.
1.30	

NOTES

1) No groundwater seepage observed.

2) Inspection pit terminated due to large PVC pipe observed at 1,30m.

3) Located next to existing reservoir.

4) Samples taken at:
S1 0,01--0,50 (2 x Bulk)
S2 0,50--0,84 (1 x Ind)
S3 0,84--1,30 (1 x Ind)

5) Refusal depth at 1,30m.

CONTRACTOR :
MACHINE : TLB 4x4 CAT
DRILLED BY :
PROFILED BY : E. Dada Mia
TYPE SET BY : K.Kistasamy
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM :
DATE : 13 May 2020
DATE : 15 May 2020
DATE : 25/06/20 12:39
TEXT : ..C:\LOGS\PITS.TXT

ELEVATION : -
X-COORD : 30 28'01.3"E
Y-COORD : 29 24'52.3"S

HOLE No: IP1

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HOLE No: IP2
Sheet 1 of 1

JOB NUMBER: 085-20

Scale 1:25

0.01--0.46

0.00 Slightly moist, dark reddish brown, loose to medium dense, fine to medium grained, gravelly clayey SAND with large pieces of shale up to 0,40m in diameter. FILL.

0.46 Slightly moist, light yellowish brown, loose to medium dense, fine to medium grained, gravelly clayey SAND. FILL.

0.86

NOTES

1) No groundwater seepage observed.

2) Inspection pit terminated due to black PVS pipe encountered at 0,86m.

3) Located next to an existing reservoir.

4) Sample taken at:
S1 0,01--0,46 (1 x Ind)

5) Final depth at 0,86m.

CONTRACTOR :
MACHINE : TLB 4x4 CAT
DRILLED BY :
PROFILED BY : E. Dada Mia
TYPE SET BY : K.Kistasamy
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM :
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DATE : 15 May 2020
DATE : 25/06/20 12:39
TEXT : ..C:\LOGS\PITS.TXT

ELEVATION : -
X-COORD : 30 28'01.5"E
Y-COORD : 29 24'52.5"S

HOLE No: IP2

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Proposed Water Supply Scheme at Mpolweni, KwaZulu-Natal within Umgungundlovu District Municipality

HOLE No: IP3
Sheet 1 of 1

JOB NUMBER: 085-20

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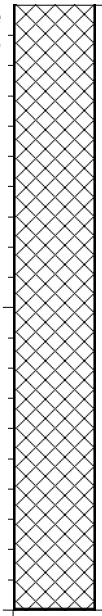

0.00 Slightly moist, dark brownish red, loose, fine to medium grained, slightly clayey SAND with pieces of paper, plastic, wire, rubber and cloth. FILL.

2.00

NOTES

1) No groundwater seepage observed.

2) Continuous collapse of sidewalls in inspection pit.

3) Located next to an existing reservoir.

4) Final depth at 2,00m.

CONTRACTOR :
MACHINE : TLB 4x4 CAT
DRILLED BY :
PROFILED BY : E. Dada Mia
TYPE SET BY : K.Kistasamy
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM :
DATE : 13 May 2020
DATE : 15 May 2020
DATE : 25/06/20 12:39
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ELEVATION : -
X-COORD : 30 28'01.2"E
Y-COORD : 29 24'52.6"S

HOLE No: IP3

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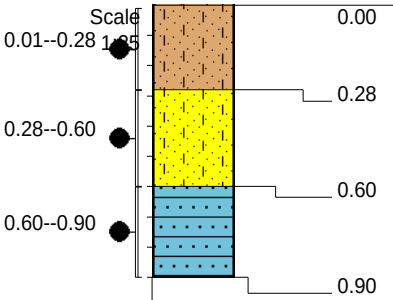
Proposed Water Supply Scheme at Mpolweni, KwaZulu-Natal within Umgungundlovu District Municipality

HOLE No: IP4
Sheet 1 of 1

JOB NUMBER: 085-20



0.00 – 0.28: Slightly moist, medium brown, loose to medium dense, fine to medium grained, silty SAND. Colluvium.

0.28 – 0.60: Slightly moist, medium brownish orange, loose to medium dense, fine to medium grained, silty SAND. Residual Sandstone.

0.60 – 0.90: Light greyish orange, highly weathered, fine to medium grained, highly fractured, very soft rock. SANDSTONE.

NOTES

1) No groundwater seepage observed.

2) Samples taken at:
S1 0,01--0,28 (1 x Ind)
S2 0,28--0,60 (1 x Ind)
S3 0,60--0,90 (2 x Bulk)

3) Refusal depth at 0,90m.

CONTRACTOR :
MACHINE : TLB 4x4 CAT
DRILLED BY :
PROFILED BY : E. Dada Mia
TYPE SET BY : K.Kistasamy
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM :
DATE : 13 May 2020
DATE : 15 May 2020
DATE : 25/06/20 12:39
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ELEVATION : -
X-COORD : 30.5204064 E
Y-COORD : -29.4543849 S

HOLE No: IP4

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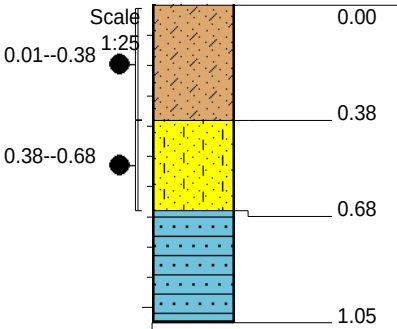
Proposed Water Supply Scheme at Mpolweni, KwaZulu-Natal within Umgungundlovu District Municipality

HOLE No: IP5
Sheet 1 of 1

JOB NUMBER: 085-20



0.00	Slightly moist, medium brownish grey, loose, fine to medium grained, slightly clayey SAND. Colluvium.
0.38	Slightly moist, medium brownish orange, loose to medium dense, fine to medium grained, silty SAND. Residual Sandstone.
0.68	Light greyish orange, highly weathered, fine to medium grained, highly fractured, very soft rock. SANDSTONE.
1.05	

NOTES

1) No groundwater seepage observed.

2) Samples taken at:
S1 0,01--0,38 (2 x Bulk)
S2 0,38--0,68 (1 x Ind)

3) Refusal depth at 1,05m.

CONTRACTOR :
MACHINE : TLB 4x4 CAT
DRILLED BY :
PROFILED BY : E. Dada Mia
TYPE SET BY : K.Kistasamy
SETUP FILE : STANDARD.SET

INCLINATION :
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DATE : 15 May 2020
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ELEVATION : -
X-COORD : 30.5203843 E
Y-COORD : -29.4543069 S

HOLE No: IP5

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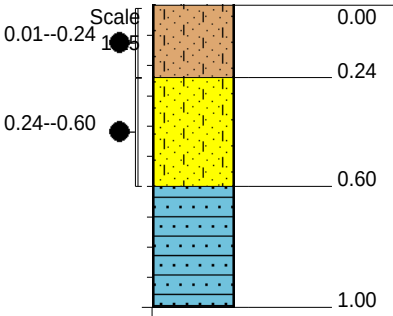
Proposed Water Supply Scheme at Mpolweni, KwaZulu-Natal within Umgungundlovu District Municipality

HOLE No: IP6
Sheet 1 of 1

JOB NUMBER: 085-20



Slightly moist, medium brownish grey, loose, fine to medium grained, silty SAND. Colluvium.

Slightly moist, medium brownish orange, loose to medium dense, fine to medium grained, silty SAND. Residual Sandstone.

Light greyish orange, highly weathered, fine to medium grained, highly fractured, very soft rock. SANDSTONE.

NOTES

1) No groundwater seepage observed.

2) Samples taken at:
S1 0,01--0,24 (1 x Ind)
S2 0,24--0,60 (1 x Ind)

3) Refusal depth at 1,00m.

CONTRACTOR :
MACHINE : TLB 4x4 CAT
DRILLED BY :
PROFILED BY : E. Dada Mia
TYPE SET BY : K.Kistasamy
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM :
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DATE : 15 May 2020
DATE : 25/06/20 12:39
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ELEVATION : -
X-COORD : 30 31'12.9"E
Y-COORD : 29 27'15.3"S

HOLE No: IP6

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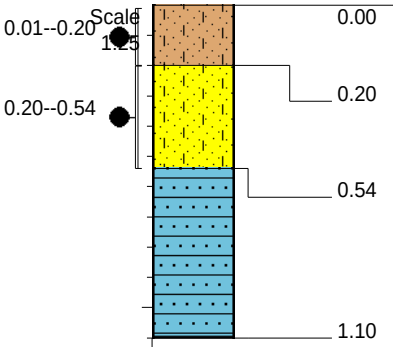
Proposed Water Supply Scheme at Mpolweni, KwaZulu-Natal within Umgungundlovu District Municipality

HOLE No: IP7
Sheet 1 of 1

JOB NUMBER: 085-20



Slightly moist, medium brown, loose to medium dense, fine to medium grained, silty SAND. Colluvium.

Slightly moist, medium brownish orange, loose to medium dense, fine to medium grained, silty SAND. Residual Sandstone.

Light greyish orange, highly weathered, fine to medium grained, highly fractured, very soft rock. SANDSTONE.

NOTES

1) No groundwater seepage observed.

2) Samples taken at:
S1 0,01--0,20 (1 x Ind)
S2 0,20--0,54 (1 x Ind)

3) Refusal depth at 1,10m.

CONTRACTOR :
MACHINE : TLB 4x4 CAT
DRILLED BY :
PROFILED BY : E. Dada Mia
TYPE SET BY : K.Kistasamy
SETUP FILE : STANDARD.SET

INCLINATION :
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DATE : 13 May 2020
DATE : 15 May 2020
DATE : 25/06/20 12:39
TEXT : ..C:\LOGS\PITS.TXT

ELEVATION : -
X-COORD : 30 31'12.7"E
Y-COORD : 29 27'15.3"S

HOLE No: IP7

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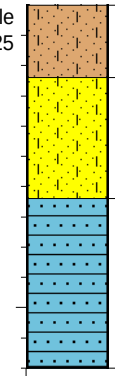
Escongweni BPH Engineers (Pty) Ltd
Proposed Water Supply Scheme at Mpolweni, KwaZulu-Natal within Umgungundlovu District Municipality

HOLE No: IP8
Sheet 1 of 1

JOB NUMBER: 085-20

Scale 1:25



0.00	Slightly moist, medium brown, loose to medium dense, fine to medium grained, silty SAND. Colluvium.
0.24	Slightly moist, medium brownish orange, loose to medium dense, fine to medium grained, silty SAND. Residual Sandstone.
0.64	Light greyish orange, highly weathered, fine to medium grained, highly fractured, very soft rock. SANDSTONE.
1.20	

NOTES

1) No groundwater seepage observed.

2) Refusal depth at 1,20m.

CONTRACTOR :
MACHINE : TLB 4x4 CAT
DRILLED BY :
PROFILED BY : E. Dada Mia

TYPE SET BY : K.Kistasamy
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM :
DATE : 13 May 2020
DATE : 15 May 2020

DATE : 25/06/20 12:39
TEXT : ..C:\LOGS\PITS.TXT

ELEVATION : -
X-COORD : 30 31' 12.9"E
Y-COORD : 29 27' 15.3"S

HOLE No: IP8

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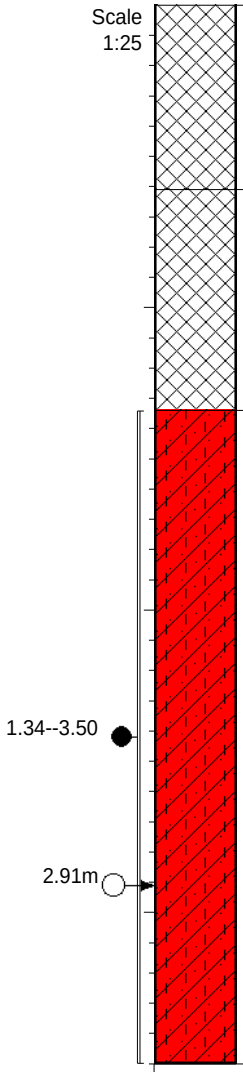
Escongweni BPH Engineers (Pty) Ltd
Proposed Water Supply Scheme at Mpolweni, KwaZulu-Natal within Umgungundlovu District Municipality

HOLE No: IP9
Sheet 1 of 1

JOB NUMBER: 085-20

Scale 1:25



0.00 Slightly moist to moist, medium brown, loose to medium dense, fine to medium grained, clayey SAND. FILL.

0.61 Slightly moist, light yellowish brown, medium dense to dense, fine to medium grained, gravelly clayey SAND with abundance of angular shaped shale fragments. FILL.

1.34 Slightly moist to moist, dark reddish brown, firm to stiff, intact, sandy silty CLAY. Residual Shale.

3.50

NOTES

1) Slight groundwater seepage observed at 2,91m.

2) Sample taken at:
S1 1,34--3,50 (1 x Bulk)

3) Final depth at 3,50m.

CONTRACTOR :
MACHINE : TLB 4x4 CAT
DRILLED BY :
PROFILED BY : E. Dada Mia
TYPE SET BY : K.Kistasamy
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM :
DATE : 13 May 2020
DATE : 15 May 2020
DATE : 25/06/20 12:39
TEXT : ..C:\LOGS\PITS.TXT

ELEVATION : -
X-COORD : 30 28'11.5"E
Y-COORD : 29 24'09.0"S

HOLE No: IP9

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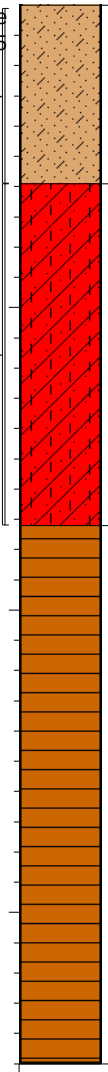
Escongweni BPH Engineers (Pty) Ltd
Proposed Water Supply Scheme at Mpolweni, KwaZulu-Natal within Umgungundlovu District Municipality

HOLE No: IP10
Sheet 1 of 1

JOB NUMBER: 085-20

Scale 1:25



0.01--0.59

0.59--1.72

0.00 — Slightly moist, dark brownish grey, loose to medium dense, fine to medium grained, clayey SAND. Colluvium.

0.59 — Slightly moist to moist, dark red, firm to stiff, intact, sandy silty CLAY. Residual Shale.

1.72 — Light yellowish orange grey, completely to highly weathered, highly fractured, very soft rock. SHALE.

3.50

NOTES

1) No groundwater seepage observed.

2) Samples taken at:
S1 0,01--0,59 (1 x Bulk)
S2 0,59--1,72 (1 x Ind)

3) Final depth at 3,50m.

CONTRACTOR :
MACHINE : TLB 4x4 CAT
DRILLED BY :
PROFILED BY : E. Dada Mia
TYPE SET BY : K.Kistasamy
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM :
DATE : 13 May 2020
DATE : 15 May 2020
DATE : 25/06/20 12:51
TEXT : ..C:\LOGS\PITS.TXT

ELEVATION : -
X-COORD : 30 28'04.1"E
Y-COORD : 29 24'40.2"S

HOLE No: IP10

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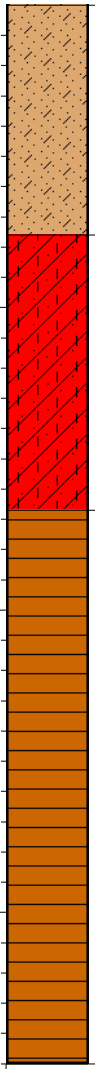
Escongweni BPH Engineers (Pty) Ltd
Proposed Water Supply Scheme at Mpolweni, KwaZulu-Natal within Umgungundlovu District Municipality

HOLE No: IP11
Sheet 1 of 1

JOB NUMBER: 085-20

Scale 1:25



0.00 Slightly moist, medium greyish brown, loose to medium dense, fine to medium grained, clayey SAND. Colluvium.

0.76 Slightly moist to moist, light to medium reddish grey, stiff, intact, silty sandy CLAY with fragments of shale. Residual Shale.

1.67 Light bluish grey, highly weathered, highly fractured, very soft rock. SHALE.

1.67--3.50

3.50

NOTES

1) No groundwater seepage observed.

2) Sample taken at:
S1 1,67--3,50 (2 x Bulk)

3) Final depth at 3,50m.

CONTRACTOR :
MACHINE : TLB 4x4 CAT
DRILLED BY :
PROFILED BY : E. Dada Mia

TYPE SET BY : K.Kistasamy
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM :
DATE : 13 May 2020
DATE : 15 May 2020

DATE : 25/06/20 12:39
TEXT : ..C:\LOGS\PITS.TXT

ELEVATION : -
X-COORD : 30 28'16.5"E
Y-COORD : 29 24'59.4"S

HOLE No: IP11

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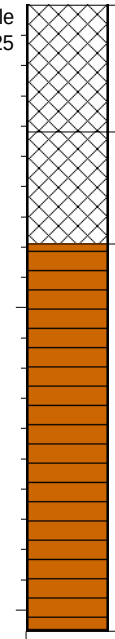
Proposed Water Supply Scheme at Mpolweni, KwaZulu-Natal within Umgungundlovu District Municipality

HOLE No: IP12
Sheet 1 of 1

JOB NUMBER: 085-20

Scale 1:25



0.00	Slightly moist, medium brownish orange, loose to medium dense, fine to medium grained, slightly gravelly clayey SAND. FILL.
0.42	Slightly moist, dark brownish grey, medium dense, fine to medium grained, gravelly clayey SAND with pieces of plastic. FILL.
0.79	Light bluish grey stained light yellow, highly weathered, highly fractured, very soft rock. SHALE.
2.07	

NOTES

1) No groundwater seepage observed.

2) Refusal depth at 2,07m.

CONTRACTOR :
MACHINE : TLB 4x4 CAT
DRILLED BY :
PROFILED BY : E. Dada Mia
TYPE SET BY : K.Kistasamy
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM :
DATE : 13 May 2020
DATE : 15 May 2020
DATE : 25/06/20 12:39
TEXT : ..C:\LOGS\PITS.TXT

ELEVATION : -
X-COORD : 30 28'41.8"E
Y-COORD : 29 25'23.6"S

HOLE No: IP12

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Proposed Water Supply Scheme at Mpolweni, KwaZulu-Natal within Umgungundlovu District Municipality

HOLE No: IP13
Sheet 1 of 1

JOB NUMBER: 085-20

0.00	Slightly moist, medium brownish grey, medium dense, fine to medium grained, slightly clayey SAND. FILL.
0.56	Slightly moist, medium orange brown, dense, fine to medium grained, gravelly clayey SAND. FILL.
0.87	Light bluish grey stained light yellow, highly weathered, highly fractured, very soft rock. SHALE.
1.60	

NOTES

1) No groundwater seepage observed.

2) Sample taken at:
S1 0,01--0,56 (1 x Bulk)

3) Refusal depth at 1,60m.

CONTRACTOR :
MACHINE : TLB 4x4 CAT
DRILLED BY :
PROFILED BY : E. Dada Mia

TYPE SET BY : K.Kistasamy
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM :
DATE : 13 May 2020
DATE : 15 May 2020

DATE : 25/06/20 12:39
TEXT : ..C:\LOGS\PITS.TXT

ELEVATION : -
X-COORD : 30 29'08.2"E
Y-COORD : 29 25'48.1"S

HOLE No: IP13

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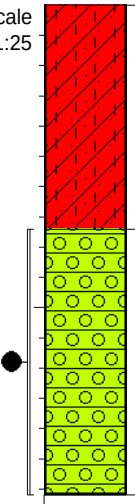
Escongweni BPH Engineers (Pty) Ltd
Proposed Water Supply Scheme at Mpolweni, KwaZulu-Natal within Umgungundlovu District Municipality

HOLE No: IP14
Sheet 1 of 1

JOB NUMBER: 085-20

Scale 1:25



0.74--1.62

0.00 Slightly moist, dark red, firm to stiff, intact, silty sandy CLAY. Residual Tillite.

0.74 Dark bluish grey stained light rusty brown, highly weathered, fine to medium grained, highly fractured, very soft rock. TILLITE.

1.62

NOTES

1) No groundwater seepage observed.

2) Sample taken at:
S1 0,74--1,62 (2 x Bulk)

3) Refusal depth at 1,62m.

CONTRACTOR :
MACHINE : TLB 4x4 CAT
DRILLED BY :
PROFILED BY : E. Dada Mia
TYPE SET BY : K.Kistasamy
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM :
DATE : 13 May 2020
DATE : 15 May 2020
DATE : 25/06/20 12:39
TEXT : ..C:\LOGS\PITS.TXT

ELEVATION : -
X-COORD : 30 29'20.9"E
Y-COORD : 29 26'14.3"S

HOLE No: IP14

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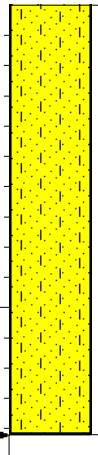
Escongweni BPH Engineers (Pty) Ltd
Proposed Water Supply Scheme at Mpolweni, KwaZulu-Natal within Umgungundlovu District Municipality

HOLE No: IP15
Sheet 1 of 1

JOB NUMBER: 085-20

Scale 1:25



0.00 Moist to wet, light orange brown, loose, fine to medium grained, silty SAND. Alluvium.

1.42

NOTES

1) Slight/moderate groundwater seepage observed at 1,42m.

2) Collapsing sidewalls observed.

3) Continuous collapse of sidewalls of inspection pit.

4) Northern side of the river crossing.

5) Final depth at 1,42m.

CONTRACTOR :
MACHINE : TLB 4x4 CAT
DRILLED BY :
PROFILED BY : E. Dada Mia
TYPE SET BY : K.Kistasamy
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM :
DATE : 13 May 2020
DATE : 15 May 2020
DATE : 25/06/20 12:39
TEXT : ..C:\LOGS\PITS.TXT

ELEVATION : -
X-COORD : 30 29'26.9"E
Y-COORD : 29 26'28.6"S

HOLE No: IP15

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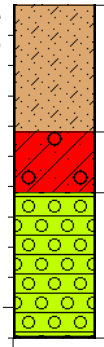
Escongweni BPH Engineers (Pty) Ltd
Proposed Water Supply Scheme at Mpolweni, KwaZulu-Natal within Umgungundlovu District Municipality

HOLE No: IP16
Sheet 1 of 1

JOB NUMBER: 085-20

Scale 1:25



0.00	Slightly moist, medium brown, loose, fine to medium grained, slightly clayey SAND with an abundance of roots. Colluvium.
0.42	Slightly moist, dark medium brownish yellow, firm to stiff, intact, gravelly sandy CLAY. Residual Tillite.
0.62	Dark bluish grey stained light rusty yellow, highly weathered, fine to medium grained, highly fractured, very soft rock. TILLITE.
1.10	

NOTES

1) No groundwater seepage observed.

2) Southern side of river crossing.

3) Refusal depth at 1,10m.

CONTRACTOR :
MACHINE : TLB 4x4 CAT
DRILLED BY :
PROFILED BY : E. Dada Mia
TYPE SET BY : K.Kistasamy
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM :
DATE : 13 May 2020
DATE : 15 May 2020
DATE : 25/06/20 12:39
TEXT : ..C:\LOGS\PITS.TXT

ELEVATION : -
X-COORD : 30 29'26.3"E
Y-COORD : 29 26'29.6"S

HOLE No: IP16

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Escongweni BPH Engineers (Pty) Ltd
Proposed Water Supply Scheme at Mpolweni, KwaZulu-Natal within Umgungundlovu District Municipality

HOLE No: IP17
Sheet 1 of 1

JOB NUMBER: 085-20

Scale 1:25

0.00	Slightly moist, medium brown, loose, fine to medium grained, silty SAND. Colluvium.
0.20	Light orange grey, highly to moderately weathered, fine to medium grained, moderately fractured, very soft to soft rock. SANDSTONE.
0.24	

NOTES

1) No groundwater seepage observed.

2) Refusal depth at 0,24m.

CONTRACTOR :
MACHINE : TLB 4x4 CAT
DRILLED BY :
PROFILED BY : E. Dada Mia
TYPE SET BY : K.Kistasamy
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM :
DATE : 13 May 2020
DATE : 15 May 2020
DATE : 25/06/20 12:39
TEXT : ..C:\LOGS\PITS.TXT

ELEVATION : -
X-COORD : 30 29'40."E
Y-COORD : 29 26'46.8"S

HOLE No: IP17

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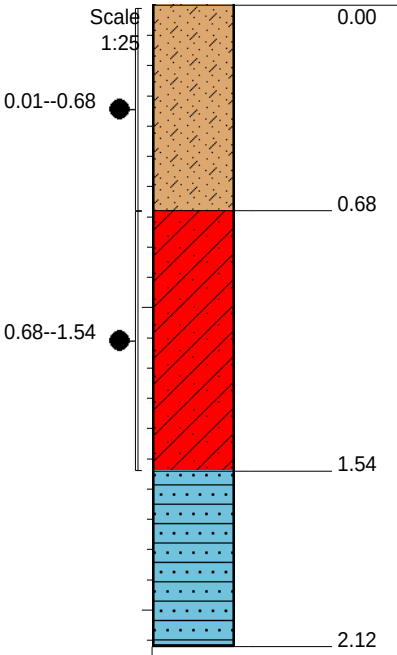
Escongweni BPH Engineers (Pty) Ltd
Proposed Water Supply Scheme at Mpolweni, KwaZulu-Natal within Umgungundlovu District Municipality

HOLE No: IP18
Sheet 1 of 1

JOB NUMBER: 085-20

Scale 1:25



0.00 Slightly moist, medium brown, loose to medium dense, fine to medium grained, slightly clayey SAND with roots. Colluvium.

0.68 Slightly moist to moist, dark red and light orange, firm to stiff, intact, sandy CLAY with sandstone fragments. Residual Sandstone.

1.54 Light orange, highly weathered, fine to medium grained, highly fractured, very soft rock. SANDSTONE.

2.12

NOTES

1) No groundwater seepage observed.

2) Samples taken at:
S1 0,01--0,68 (1 x Bulk)
S2 0,68--1,54 (1 x Ind)

3) Refusal depth at 2,12m.

CONTRACTOR :
MACHINE : TLB 4x4 CAT
DRILLED BY :
PROFILED BY : E. Dada Mia

TYPE SET BY : K.Kistasamy
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM :
DATE : 13 May 2020
DATE : 15 May 2020

DATE : 25/06/20 12:39
TEXT : ..C:\LOGS\PITS.TXT

ELEVATION : -
X-COORD : 30 30'07.5"E
Y-COORD : 29 27'02.9"S

HOLE No: IP18

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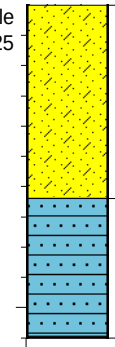
Proposed Water Supply Scheme at Mpolweni, KwaZulu-Natal within Umgungundlovu District Municipality

HOLE No: IP19
Sheet 1 of 1

JOB NUMBER: 085-20

Scale 1:25



0.00 Slightly moist, medium reddish brown, loose to medium dense, fine to medium grained, slightly clayey SAND with sandstone fragments. Residual Sandstone.

0.64 Light pinkish grey, highly to moderately weathered, fine to medium grained, moderately fractured, very soft to soft rock. SANDSTONE.

1.10

NOTES

1) No groundwater seepage observed.

2) Refusal depth at 1,10m.

CONTRACTOR :
MACHINE : TLB 4x4 CAT
DRILLED BY :
PROFILED BY : E. Dada Mia
TYPE SET BY : K.Kistasamy
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM :
DATE : 13 May 2020
DATE : 15 May 2020
DATE : 25/06/20 12:39
TEXT : ..C:\LOGS\PITS.TXT

ELEVATION : -
X-COORD : 30 30'36.7"E
Y-COORD : 29 27'11.2"S

HOLE No: IP19

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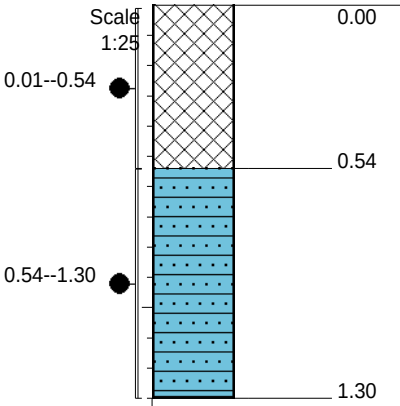
Proposed Water Supply Scheme at Mpolweni, KwaZulu-Natal within Umgungundlovu District Municipality

HOLE No: IP20
Sheet 1 of 1

JOB NUMBER: 085-20

Scale 1:25



0.00 — Slightly moist, medium brownish orange, medium dense, fine to medium grained, silty SAND with pieces of asphalt. FILL.

0.54 — Light purplish grey, completely to highly weathered, fine to medium grained, highly fractured, very soft rock. SANDSTONE.

1.30

NOTES

1) No groundwater seepage observed.

2) Samples taken at:
S1 0,01--0,54 (1 x Bulk)
S2 0,54--1,30 (2 x Bulk)

3) Refusal depth at 1,30m.

CONTRACTOR :
MACHINE : TLB 4x4 CAT
DRILLED BY :
PROFILED BY : E. Dada Mia
TYPE SET BY : K.Kistasamy
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM :
DATE : 13 May 2020
DATE : 15 May 2020
DATE : 25/06/20 12:39
TEXT : ..C:\LOGS\PITS.TXT

ELEVATION : -
X-COORD : 30 30'52.4"E
Y-COORD : 29 27'11.5"S

HOLE No: IP20

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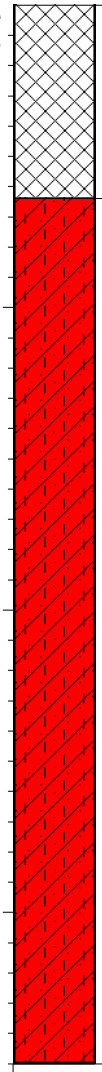
Proposed Water Supply Scheme at Mpolweni, KwaZulu-Natal within Umgungundlovu District Municipality

HOLE No: IP21
Sheet 1 of 1

JOB NUMBER: 085-20

Scale 1:25



0.00 Slightly moist, medium brownish red, loose to medium dense, fine to medium grained, clayey SAND with plastic. FILL.

0.64 Slightly moist to moist, dark reddish orange, firm to stiff, intact, silty sandy CLAY. Residual Dolerite.

3.50

NOTES

1) No groundwater seepage observed.

2) Final depth at 3,50m.

CONTRACTOR :
MACHINE : TLB 4x4 CAT
DRILLED BY :
PROFILED BY : E. Dada Mia
TYPE SET BY : K.Kistasamy
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM :
DATE : 13 May 2020
DATE : 15 May 2020
DATE : 25/06/20 12:39
TEXT : ..C:\LOGS\PITS.TXT

ELEVATION : -
X-COORD : 30 27'59.0"E
Y-COORD : 29 24'03.9"S

HOLE No: IP21

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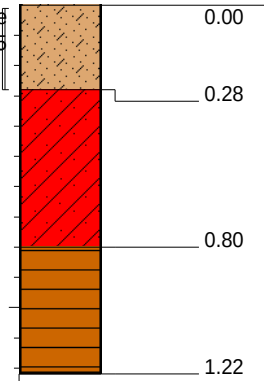
Proposed Water Supply Scheme at Mpolweni, KwaZulu-Natal within Umgungundlovu District Municipality

HOLE No: IP22
Sheet 1 of 1

JOB NUMBER: 085-20



0.00 Slightly moist, medium brown, loose to medium dense, fine to medium grained, slightly clayey SAND. Colluvium.

0.28 Slightly moist to moist, medium brownish orange, firm to stiff, intact, sandy CLAY. Residual Shale.

0.80 Dark bluish grey stained light yellow, highly weathered, highly fractured, very soft rock. SHALE.

1.22

NOTES

1) No groundwater seepage observed.

2) Sample taken at:
S1 0,01--0,28 (1 x Bulk)

3) Refusal depth at 1,22m.

CONTRACTOR :
MACHINE : TLB 4x4 CAT
DRILLED BY :
PROFILED BY : E. Dada Mia

TYPE SET BY : K.Kistasamy
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM :
DATE : 13 May 2020
DATE : 15 May 2020

DATE : 25/06/20 12:39
TEXT : ..C:\LOGS\PITS.TXT

ELEVATION : -
X-COORD : 30 28'00.1"E
Y-COORD : 29 24'20.5"S

HOLE No: IP22

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Escongweni BPH Engineers (Pty) Ltd
Proposed Water Supply Scheme at Mpolweni, KwaZulu-Natal within Umgungundlovu District Municipality

HOLE No: IP23
Sheet 1 of 1

JOB NUMBER: 085-20

0.00	Slightly moist, medium brown, loose to medium dense, fine to medium grained, slightly clayey SAND. Colluvium.
0.39	
	Slightly moist to moist, medium brownish orange, firm to stiff, intact, sandy CLAY. Residual Shale.
0.74	
	Dark bluish grey stained light yellow, highly weathered, highly fractured, very soft rock. SHALE.
1.62	

NOTES

1) No groundwater seepage observed.

2) Sample taken at:
S1 0,39--0,74 (1 x Ind)

3) Refusal depth at 1,62m.

CONTRACTOR :
MACHINE : TLB 4x4 CAT
DRILLED BY :
PROFILED BY : E. Dada Mia
TYPE SET BY : K.Kistasamy
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM :
DATE : 13 May 2020
DATE : 15 May 2020
DATE : 25/06/20 12:39
TEXT : ..C:\LOGS\PITS.TXT

ELEVATION : -
X-COORD : 30 28'24.4"E
Y-COORD : 29 24'17.6"S

HOLE No: IP23

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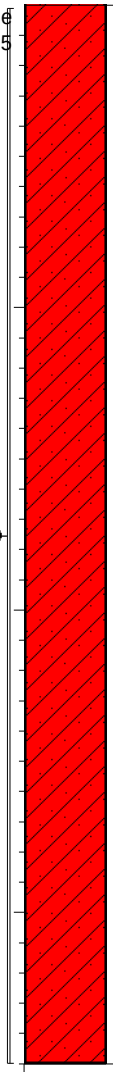
Escongweni BPH Engineers (Pty) Ltd
Proposed Water Supply Scheme at Mpolweni, KwaZulu-Natal within Umgungundlovu District Municipality

HOLE No: IP24
Sheet 1 of 1

JOB NUMBER: 085-20

Scale 1:25



0.00 Slightly moist to moist, dark reddish brown, firm to stiff, intact, sandy CLAY. Residual Tillite.

0.01--3.50

3.50

NOTES

1) No groundwater seepage observed.

2) Sample taken at:
S1 0,01--3,50 (1 x Ind)

3) Final depth at 3,50m.

CONTRACTOR :
MACHINE : TLB 4x4 CAT
DRILLED BY :
PROFILED BY : E. Dada Mia
TYPE SET BY : K.Kistasamy
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM :
DATE : 13 May 2020
DATE : 15 May 2020
DATE : 25/06/20 12:39
TEXT : ..C:\LOGS\PITS.TXT

ELEVATION : -
X-COORD : 30 28'51.9"E
Y-COORD : 29 24'02.7"S

HOLE No: IP24

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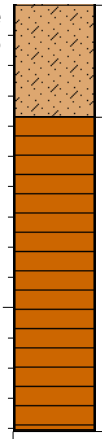
Proposed Water Supply Scheme at Mpolweni, KwaZulu-Natal within Umgungundlovu District Municipality

HOLE No: IP25
Sheet 1 of 1

JOB NUMBER: 085-20

Scale 1:25



0.00 Slightly moist, medium brown, loose to medium dense, fine to medium grained, clayey SAND. Colluvium.

0.37 Light yellowish grey stained rusty brown, highly weathered, highly fractured, very soft rock. SHALE.

1.41

NOTES

1) No groundwater seepage observed.

2) Refusal depth at 1,41m.

CONTRACTOR :
MACHINE : TLB 4x4 CAT
DRILLED BY :
PROFILED BY : E. Dada Mia
TYPE SET BY : K.Kistasamy
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM :
DATE : 13 May 2020
DATE : 15 May 2020
DATE : 25/06/20 12:39
TEXT : ..C:\LOGS\PITS.TXT

ELEVATION : -
X-COORD : 30 28'48.7"E
Y-COORD : 29 24'14.9"S

HOLE No: IP25

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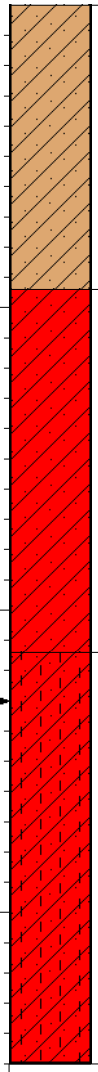
Escongweni BPH Engineers (Pty) Ltd
Proposed Water Supply Scheme at Mpolweni, KwaZulu-Natal within Umgungundlovu District Municipality

HOLE No: IP26
Sheet 1 of 1

JOB NUMBER: 085-20

Scale 1:25



0.00 Slightly moist, dark brown, firm, intact, sandy CLAY with roots. Colluvium.

0.94 Slightly moist to moist, dark grey mottled light yellow, firm to stiff, intact, sandy CLAY. Residual Tillite.

2.14 Moist to wet, dark reddish orange, stiff, intact, silty sandy CLAY. Residual Tillite.

3.50

NOTES

1) Slight/moderate groundwater seepage observed at 2,30m.

2) Final depth at 3,50m.

CONTRACTOR :
MACHINE : TLB 4x4 CAT
DRILLED BY :
PROFILED BY : E. Dada Mia
TYPE SET BY : K.Kistasamy
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM :
DATE : 13 May 2020
DATE : 15 May 2020
DATE : 25/06/20 12:39
TEXT : ..C:\LOGS\PITS.TXT

ELEVATION : -
X-COORD : 30 29'16.6"E
Y-COORD : 29 24'11.6"S

HOLE No: IP26

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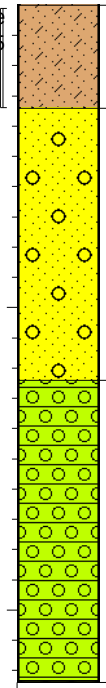
Escongweni BPH Engineers (Pty) Ltd
Proposed Water Supply Scheme at Mpolweni, KwaZulu-Natal within Umgungundlovu District Municipality

HOLE No: IP27
Sheet 1 of 1

JOB NUMBER: 085-20

Scale 1:25



0.00	Slightly moist, medium brown, loose to medium dense, fine to medium grained, slightly clayey SAND with roots. Colluvium.
0.34	Slightly moist, light yellowish orange mottled dark grey, dense, fine to coarse grained, gravelly SAND. Ferricrete.
1.24	Light yellowish orange stained rusty brown, highly weathered, fine to medium grained, highly fractured, very soft rock. TILLITE.
2.24	

NOTES

1) No groundwater seepage observed.

2) Located on a slope.

3) Sample taken at:
S1 0,01--0,34 (1 x Bulk)

4) Refusal depth at 2,24m.

CONTRACTOR :
MACHINE : TLB 4x4 CAT
DRILLED BY :
PROFILED BY : E. Dada Mia

TYPE SET BY : K.Kistasamy
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM :
DATE : 13 May 2020
DATE : 15 May 2020

DATE : 25/06/20 12:39
TEXT : ..C:\LOGS\PITS.TXT

ELEVATION : -
X-COORD : 30 29'15.3"E
Y-COORD : 29 24'29.8"S

HOLE No: IP27

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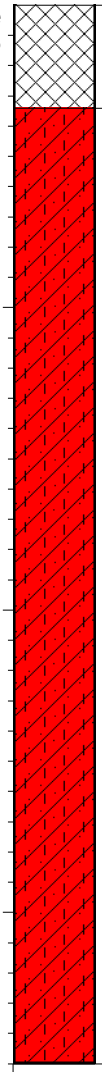
HOLE No: IP28
Sheet 1 of 1

JOB NUMBER: 085-20

Scale 1:25



0.00 Slightly moist, medium brownish yellow, medium dense, fine to medium grained, gravelly clayey SAND. FILL.

0.34 Slightly moist to moist, dark reddish orange, firm to stiff, intact, sandy silty CLAY. Residual Tillite.

3.50

NOTES

1) No groundwater seepage observed.

2) Final depth at 3,50m.

CONTRACTOR :
MACHINE : TLB 4x4 CAT
DRILLED BY :
PROFILED BY : E. Dada Mia
TYPE SET BY : K.Kistasamy
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM :
DATE : 13 May 2020
DATE : 15 May 2020
DATE : 25/06/20 12:39
TEXT : ..C:\LOGS\PITS.TXT

ELEVATION : -
X-COORD : 30 29'01.5"E
Y-COORD : 29 24'24.9"S

HOLE No: IP28

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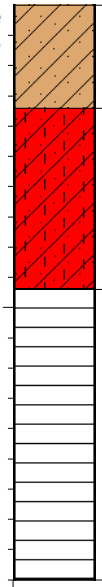
Proposed Water Supply Scheme at Mpolweni, KwaZulu-Natal within Umgungundlovu District Municipality

HOLE No: IP29
Sheet 1 of 1

JOB NUMBER: 085-20

Scale 1:25



0.00	Slightly moist, medium brownish red, firm to stiff, intact, sandy CLAY. Colluvium.
0.34	Slightly moist, dark red, stiff, intact, sandy silty CLAY. Residual Shale.
0.94	Light grey stained light yellow, highly weathered, highly fractured, very soft rock. SHALE.
1.90	

NOTES

1) No groundwater seepage observed.

2) Refusal depth at 1,90m.

CONTRACTOR :
MACHINE : TLB 4x4 CAT
DRILLED BY :
PROFILED BY : E. Dada Mia

TYPE SET BY : K.Kistasamy
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM :
DATE : 13 May 2020
DATE : 15 May 2020

DATE : 25/06/20 12:39
TEXT : ..C:\LOGS\PITS.TXT

ELEVATION : -
X-COORD : 30 28'47.3"E
Y-COORD : 29 24'36.8"S

HOLE No: IP29

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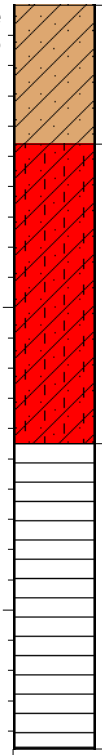
Escongweni BPH Engineers (Pty) Ltd
Proposed Water Supply Scheme at Mpolweni, KwaZulu-Natal within Umgungundlovu District Municipality

HOLE No: IP30
Sheet 1 of 1

JOB NUMBER: 085-20

Scale 1:25



0.00	Slightly moist, medium brownish red, firm to stiff, intact, sandy CLAY. Colluvium.
0.46	Slightly moist, dark red, stiff, intact, sandy silty CLAY. Residual Shale.
1.45	Light grey stained light yellow, highly weathered, highly fractured, very soft rock. SHALE.
2.46	

NOTES

1) No groundwater seepage observed.

2) Refusal depth at 2,46m.

CONTRACTOR :
MACHINE : TLB 4x4 CAT
DRILLED BY :
PROFILED BY : E. Dada Mia
TYPE SET BY : K.Kistasamy
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM :
DATE : 13 May 2020
DATE : 15 May 2020
DATE : 25/06/20 12:39
TEXT : ..C:\LOGS\PITS.TXT

ELEVATION : -
X-COORD : 30 28'31.9"E
Y-COORD : 29 24'31.0"S

HOLE No: IP30

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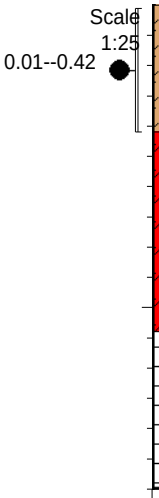
Escongweni BPH Engineers (Pty) Ltd
Proposed Water Supply Scheme at Mpolweni, KwaZulu-Natal within Umgungundlovu District Municipality

HOLE No: IP31
Sheet 1 of 1

JOB NUMBER: 085-20

Scale 1:25



0.00	Slightly moist, medium brownish grey, loose to medium dense, fine to medium grained, clayey SAND. Colluvium.
0.42	Slightly moist, dark red, stiff, intact, sandy silty CLAY. Residual Dolerite.
1.08	Light grey stained light yellow, highly weathered, highly fractured, very soft rock. SHALE.
1.60	

NOTES

1) No groundwater seepage observed.

2) Sample taken at:
S1 0,01--0,42 (1 x Bulk)

3) Refusal depth at 1,60m.

CONTRACTOR :
MACHINE : TLB 4x4 CAT
DRILLED BY :
PROFILED BY : E. Dada Mia
TYPE SET BY : K.Kistasamy
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM :
DATE : 13 May 2020
DATE : 15 May 2020
DATE : 25/06/20 12:39
TEXT : ..C:\LOGS\PITS.TXT

ELEVATION : -
X-COORD : 30 28'22.4"E
Y-COORD : 29 24'44.6"S

HOLE No: IP31

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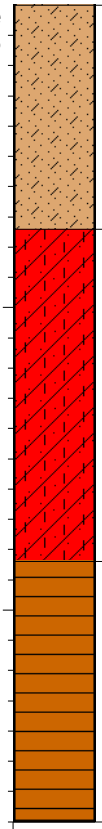
Proposed Water Supply Scheme at Mpolweni, KwaZulu-Natal within Umgungundlovu District Municipality

HOLE No: IP32
Sheet 1 of 1

JOB NUMBER: 085-20

Scale 1:25



0.00 Slightly moist, medium greyish brown, loose to medium dense, fine to medium grained, clayey SAND. Colluvium.

0.74 Slightly moist to moist, light reddish grey, stiff, intact, silty sandy CLAY. Residual Shale.

1.84 Light bluish grey, highly weathered, highly fractured, very soft rock. SHALE.

2.70

NOTES

1) No groundwater seepage observed.

2) Refusal depth at 2,70m.

CONTRACTOR :
MACHINE : TLB 4x4 CAT
DRILLED BY :
PROFILED BY : E. Dada Mia
TYPE SET BY : K.Kistasamy
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM :
DATE : 13 May 2020
DATE : 15 May 2020
DATE : 25/06/20 12:39
TEXT : ..C:\LOGS\PITS.TXT

ELEVATION : -
X-COORD : 30 28'42.7"E
Y-COORD : 29 25'01.6"S

HOLE No: IP32

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Proposed Water Supply Scheme at Mpolweni, KwaZulu-Natal within Umgungundlovu District Municipality

HOLE No: IP33
Sheet 1 of 1

JOB NUMBER: 085-20

0.00	Slightly moist, medium brown, loose to medium dense, fine to medium grained, slightly clayey SAND. Colluvium.
0.40	Slightly moist, light brown, loose to medium dense, fine to medium grained, silty SAND. Elluvium.
0.90	Slightly moist, light grey stained orange, dense, fine to medium grained, silty sandy GRAVEL. Ferricrete.
1.80	

NOTES

1) No groundwater seepage observed.

2) Samples taken at:
S1 0,01--0,40 (1 x Bulk)
S2 0,40--0,90 (1 x Bulk)

3) Refusal depth at 1,80m.

CONTRACTOR :
MACHINE : TLB 4x4 CAT
DRILLED BY :
PROFILED BY : E. Dada Mia

TYPE SET BY : K.Kistasamy
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM :
DATE : 13 May 2020
DATE : 15 May 2020

DATE : 25/06/20 12:39
TEXT : ..C:\LOGS\PITS.TXT

ELEVATION : -
X-COORD : 30 29'08.6"E
Y-COORD : 29 25'11.7"S

HOLE No: IP33

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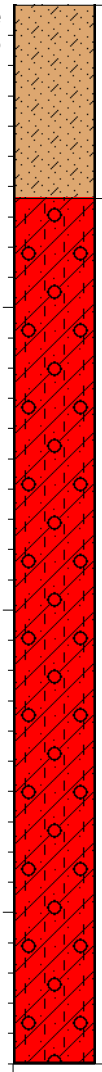
Proposed Water Supply Scheme at Mpolweni, KwaZulu-Natal within Umgungundlovu District Municipality

HOLE No: IP34
Sheet 1 of 1

JOB NUMBER: 085-20

Scale 1:25



0.00 Slightly moist, medium brownish grey, loose to medium dense, fine to medium grained, clayey SAND. Colluvium.

0.64 Slightly moist, dark orange reddish brown, firm to stiff, intact, silty gravelly sandy CLAY with gneiss fragments. Residual Gneiss.

3.50

NOTES

1) No groundwater seepage observed.

2) Final depth at 3,50m.

CONTRACTOR :
MACHINE : TLB 4x4 CAT
DRILLED BY :
PROFILED BY : E. Dada Mia
TYPE SET BY : K.Kistasamy
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM :
DATE : 13 May 2020
DATE : 15 May 2020
DATE : 25/06/20 12:39
TEXT : ..C:\LOGS\PITS.TXT

ELEVATION : -
X-COORD : 30 29'29.8"E
Y-COORD : 29 25'29.7"S

HOLE No: IP34

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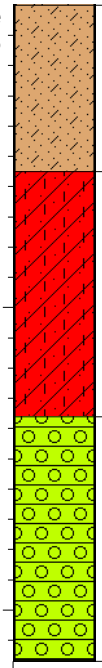
Proposed Water Supply Scheme at Mpolweni, KwaZulu-Natal within Umgungundlovu District Municipality

HOLE No: IP35
Sheet 1 of 1

JOB NUMBER: 085-20

Scale 1:25



0.00	Slightly moist, medium brownish grey, loose to medium dense, fine to medium grained, clayey SAND. Colluvium.
0.55	Slightly moist, medium orange red, firm to stiff, intact, silty sandy CLAY. Residual Tillite.
1.36	Dark grey stained rusty brown and light yellow, highly weathered, fine to medium grained, highly fractured, very soft rock. TILLITE.
2.17	

NOTES

1) No groundwater seepage observed.

2) Refusal depth at 2,17m.

CONTRACTOR :
MACHINE : TLB 4x4 CAT
DRILLED BY :
PROFILED BY : E. Dada Mia
TYPE SET BY : K.Kistasamy
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM :
DATE : 13 May 2020
DATE : 15 May 2020
DATE : 25/06/20 12:39
TEXT : ..C:\LOGS\PITS.TXT

ELEVATION : -
X-COORD : 30 29'34.4"E
Y-COORD : 29 25'58.0"S

HOLE No: IP35

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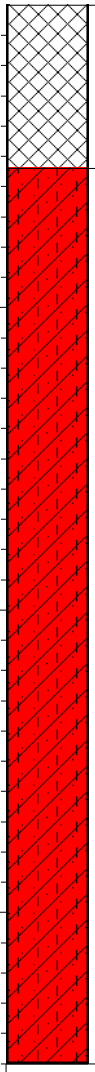
Proposed Water Supply Scheme at Mpolweni, KwaZulu-Natal within Umgungundlovu District Municipality

HOLE No: IP36
Sheet 1 of 1

JOB NUMBER: 085-20

Scale 1:25



0.00 Slightly moist, medium brownish grey, loose to medium dense, fine to medium grained, clayey SAND. FILL.

0.54 Slightly moist to moist, dark reddish orange, firm to stiff, intact, sandy silty CLAY. Residual Dolerite.

0.54--3.50

3.50

NOTES

1) No groundwater seepage observed.

2) Orange and black PVC pipes observed at 0,30m.

3) Sample taken at:
S1 0,54--3,50 (1 x Ind)

4) Final depth at 3,50m.

CONTRACTOR :
MACHINE : TLB 4x4 CAT
DRILLED BY :
PROFILED BY : E. Dada Mia
TYPE SET BY : K.Kistasamy
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM :
DATE : 13 May 2020
DATE : 15 May 2020
DATE : 25/06/20 12:39
TEXT : ..C:\LOGS\PITS.TXT

ELEVATION : -
X-COORD : 30 27'57.3"E
Y-COORD : 29 25'15.2"S

HOLE No: IP36

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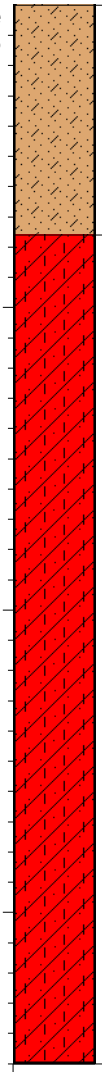
Escongweni BPH Engineers (Pty) Ltd
Proposed Water Supply Scheme at Mpolweni, KwaZulu-Natal within Umgungundlovu District Municipality

HOLE No: IP37
Sheet 1 of 1

JOB NUMBER: 085-20

Scale 1:25



0.00 Slightly moist, medium brown, loose to medium dense, fine to medium grained, clayey SAND. Colluvium.

0.76 Slightly moist to moist, dark reddish orange, firm to stiff, intact, sandy silty CLAY. Residual Dolerite.

3.50

NOTES

1) No groundwater seepage observed.

2) Final depth at 3,50m.

CONTRACTOR :
MACHINE : TLB 4x4 CAT
DRILLED BY :
PROFILED BY : E. Dada Mia
TYPE SET BY : K.Kistasamy
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM :
DATE : 13 May 2020
DATE : 15 May 2020
DATE : 25/06/20 12:39
TEXT : ..C:\LOGS\PITS.TXT

ELEVATION : -
X-COORD : 30 28'07.6"E
Y-COORD : 29 25'45.9"S

HOLE No: IP37

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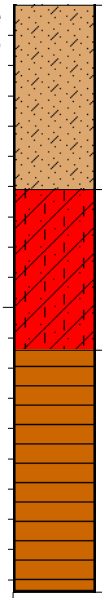
Escongweni BPH Engineers (Pty) Ltd
Proposed Water Supply Scheme at Mpolweni, KwaZulu-Natal within Umgungundlovu District Municipality

HOLE No: IP38
Sheet 1 of 1

JOB NUMBER: 085-20

Scale 1:25



0.00 — Slightly moist, medium brownish grey, loose to medium dense, fine to medium grained, slightly clayey SAND. Colluvium.

0.61 — Slightly moist, medium brownish red, firm to stiff, intact, silty sandy CLAY with shale fragments. Residual Shale.

1.14 — Light bluish grey stained light yellow, highly weathered, highly fractured, very soft rock. SHALE.

1.94

NOTES

1) No groundwater seepage observed.

2) Refusal depth at 1,94m.

CONTRACTOR :
MACHINE : TLB 4x4 CAT
DRILLED BY :
PROFILED BY : E. Dada Mia
TYPE SET BY : K.Kistasamy
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM :
DATE : 13 May 2020
DATE : 15 May 2020
DATE : 25/06/20 12:39
TEXT : ..C:\LOGS\PITS.TXT

ELEVATION : -
X-COORD : 30 28'35.6"E
Y-COORD : 29 25'49.3"S

HOLE No: IP38

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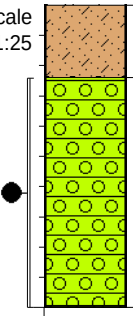
Escongweni BPH Engineers (Pty) Ltd
Proposed Water Supply Scheme at Mpolweni, KwaZulu-Natal within Umgungundlovu District Municipality

HOLE No: IP39
Sheet 1 of 1

JOB NUMBER: 085-20

Scale 1:25



0.00	Slightly moist, medium brown, loose to medium dense, slightly clayey SAND. Colluvium.
0.24	Dark bluish grey stained rusty brown and light yellow, highly weathered, fine to medium grained, highly fractured, very soft rock. TILLITE.
1.00	

NOTES

1) No groundwater seepage observed.

2) Sample taken at:
S1 0,24--1,00 (2 x Bulk)

3) Refusal depth at 1,00m.

CONTRACTOR :
MACHINE : TLB 4x4 CAT
DRILLED BY :
PROFILED BY : E. Dada Mia
TYPE SET BY : K.Kistasamy
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM :
DATE : 13 May 2020
DATE : 15 May 2020
DATE : 25/06/20 12:39
TEXT : ..C:\LOGS\PITS.TXT

ELEVATION : -
X-COORD : 30 29'01.2"E
Y-COORD : 29 26'31.6"S

HOLE No: IP39

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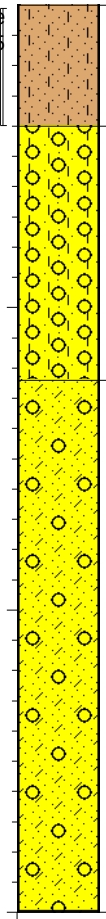
Escongweni BPH Engineers (Pty) Ltd
Proposed Water Supply Scheme at Mpolweni, KwaZulu-Natal within Umgungundlovu District Municipality

HOLE No: IP40
Sheet 1 of 1

JOB NUMBER: 085-20

Scale 1:25

0.01--0.40



0.00 Slightly moist, light grey, loose, fine to medium grained, silty SAND. Colluvium.

0.40 Slightly moist, light grey stained light orange and dark grey, dense, fine to medium grained, silty sandy GRAVEL. Ferricrete.

1.24 Slightly moist, light yellow, medium dense, fine to medium grained, gravelly clayey SAND. Residual Gneiss.

3.00

NOTES

1) No groundwater seepage observed.

2) Sample taken at:
S1 0,01--0,40 (1 x Bulk)

3) Refusal depth at 3,00m.

CONTRACTOR :
MACHINE : TLB 4x4 CAT
DRILLED BY :
PROFILED BY : E. Dada Mia
TYPE SET BY : K.Kistasamy
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM :
DATE : 13 May 2020
DATE : 15 May 2020
DATE : 25/06/20 12:39
TEXT : ..C:\LOGS\PITS.TXT

ELEVATION : -
X-COORD : 30 29'24.3"E
Y-COORD : 29 25'11.0"S

HOLE No: IP40

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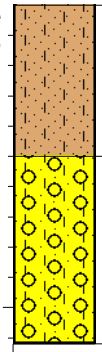
Escongweni BPH Engineers (Pty) Ltd
Proposed Water Supply Scheme at Mpolweni, KwaZulu-Natal within Umgungundlovu District Municipality

HOLE No: IP41
Sheet 1 of 1

JOB NUMBER: 085-20

Scale 1:25



0.00 Slightly moist, light grey, loose, fine to medium grained, silty SAND. Colluvium.

0.50 Slightly moist, light grey stained light orange and dark grey, dense, fine to medium grained, silty sandy GRAVEL. Ferricrete.

1.12

NOTES

1) No groundwater seepage observed.

2) Refusal depth at 1,20m.

CONTRACTOR :
MACHINE : TLB 4x4 CAT
DRILLED BY :
PROFILED BY : E. Dada Mia
TYPE SET BY : K.Kistasamy
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM :
DATE : 13 May 2020
DATE : 15 May 2020
DATE : 25/06/20 12:39
TEXT : ..C:\LOGS\PITS.TXT

ELEVATION : -
X-COORD : 30 29'38.2"E
Y-COORD : 29 24'54.7"S

HOLE No: IP41

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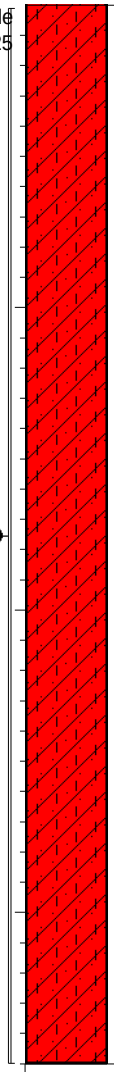
Escongweni BPH Engineers (Pty) Ltd
Proposed Water Supply Scheme at Mpolweni, KwaZulu-Natal within Umgungundlovu District Municipality

HOLE No: IP42
Sheet 1 of 1

JOB NUMBER: 085-20

Scale 1:25



0.00 Slightly moist, medium red, firm to stiff, intact, silty sandy CLAY. Residual Gneiss.

0.01--3.50

3.50

NOTES

1) No groundwater seepage observed.

2) Sample taken at:
S1 0,01--3,50 (1 x Ind)

3) Final depth at 3,50m.

CONTRACTOR :
MACHINE : TLB 4x4 CAT
DRILLED BY :
PROFILED BY : E. Dada Mia
TYPE SET BY : K.Kistasamy
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM :
DATE : 13 May 2020
DATE : 15 May 2020
DATE : 25/06/20 12:39
TEXT : ..C:\LOGS\PITS.TXT

ELEVATION : -
X-COORD : 30 30'00.2"E
Y-COORD : 29 24'46.9"S

HOLE No: IP42

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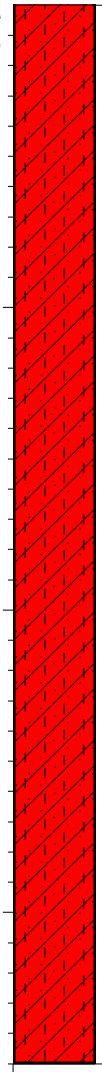
Escongweni BPH Engineers (Pty) Ltd
Proposed Water Supply Scheme at Mpolweni, KwaZulu-Natal within Umgungundlovu District Municipality

HOLE No: IP43
Sheet 1 of 1

JOB NUMBER: 085-20

Scale 1:25



0.00 Slightly moist to moist, dark red, firm to stiff, intact, silty sandy CLAY. Residual Gneiss.

3.50

NOTES

1) No groundwater seepage observed.

2) Final depth at 3,50m.

CONTRACTOR :
MACHINE : TLB 4x4 CAT
DRILLED BY :
PROFILED BY : E. Dada Mia

TYPE SET BY : K.Kistasamy
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM :
DATE : 13 May 2020
DATE : 15 May 2020

DATE : 25/06/20 12:39
TEXT : ..C:\LOGS\PITS.TXT

ELEVATION : -
X-COORD : 30 30'16.6"E
Y-COORD : 29 24'57.9"S

HOLE No: IP43

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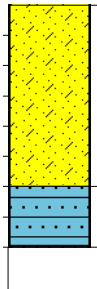
Escongweni BPH Engineers (Pty) Ltd
Proposed Water Supply Scheme at Mpolweni, KwaZulu-Natal within Umgungundlovu District Municipality

HOLE No: IP44
Sheet 1 of 1

JOB NUMBER: 085-20

Scale 1:25



0.00 Slightly moist, light pinkish grey, loose to medium dense, fine to medium grained, slightly clayey SAND. Residual Sandstone.

0.60 Light purplish pink, highly weathered, fine to medium grained, highly fractured, very soft rock. SANDSTONE.

0.80

NOTES

1) No groundwater seepage observed.

2) Refusal depth at 0,80m.

CONTRACTOR :
MACHINE : TLB 4x4 CAT
DRILLED BY :
PROFILED BY : E. Dada Mia
TYPE SET BY : K.Kistasamy
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM :
DATE : 13 May 2020
DATE : 15 May 2020
DATE : 25/06/20 12:39
TEXT : ..C:\LOGS\PITS.TXT

ELEVATION : -
X-COORD : 30 30'11.6"E
Y-COORD : 29 24'45.7"S

HOLE No: IP44

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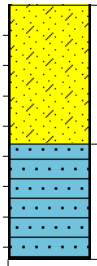
Escongweni BPH Engineers (Pty) Ltd
Proposed Water Supply Scheme at Mpolweni, KwaZulu-Natal within Umgungundlovu District Municipality

HOLE No: IP45
Sheet 1 of 1

JOB NUMBER: 085-20

Scale 1:25



0.00	Slightly moist, light pinkish grey, loose to medium dense, fine to medium grained, slightly clayey SAND. Residual Sandstone.
0.46	Light purplish pink, highly weathered, fine to medium grained, highly fractured, very soft rock. SANDSTONE.
0.84	

NOTES

1) No groundwater seepage observed.

2) Refusal depth at 0,84m.

CONTRACTOR :
MACHINE : TLB 4x4 CAT
DRILLED BY :
PROFILED BY : E. Dada Mia
TYPE SET BY : K.Kistasamy
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM :
DATE : 13 May 2020
DATE : 15 May 2020
DATE : 25/06/20 12:39
TEXT : ..C:\LOGS\PITS.TXT

ELEVATION : -
X-COORD : 30 30'05.7"E
Y-COORD : 29 24'27.5"S

HOLE No: IP45

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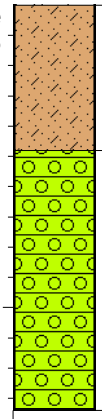
Escongweni BPH Engineers (Pty) Ltd
Proposed Water Supply Scheme at Mpolweni, KwaZulu-Natal within Umgungundlovu District Municipality

HOLE No: IP46
Sheet 1 of 1

JOB NUMBER: 085-20

Scale 1:25



0.00	Slightly moist, medium brown, loose to medium dense, slightly clayey SAND. Colluvium.
0.48	Dark bluish grey stained rusty brown and light yellow, highly weathered, fine to medium grained, highly fractured, very soft rock. TILLITE.
1.34	

NOTES

1) No groundwater seepage observed.

2) Refusal depth at 1,34m.

CONTRACTOR :
MACHINE : TLB 4x4 CAT
DRILLED BY :
PROFILED BY : E. Dada Mia
TYPE SET BY : K.Kistasamy
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM :
DATE : 13 May 2020
DATE : 15 May 2020
DATE : 25/06/20 12:39
TEXT : ..C:\LOGS\PITS.TXT

ELEVATION : -
X-COORD : 30 29'06.3"E
Y-COORD : 29 26'38.9"S

HOLE No: IP46

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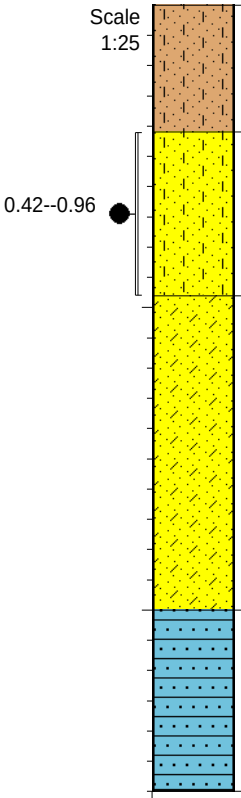
Escongweni BPH Engineers (Pty) Ltd
Proposed Water Supply Scheme at Mpolweni, KwaZulu-Natal within Umgungundlovu District Municipality

HOLE No: IP47
Sheet 1 of 1

JOB NUMBER: 085-20

Scale 1:25



0.00	Slightly moist, light grey, loose, fine to medium grained, silty SAND with roots. Colluvium.
0.42	Slightly moist, light orange, loose, fine to medium grained, silty SAND with sandstone fragments. Residual Sandstone.
0.96	Slightly moist, medium orange brown, loose to medium dense, fine to medium grained, clayey SAND. Residual Sandstone.
2.00	Light orange grey, highly weathered, fine to medium grained, highly fractured, very soft rock. SANDSTONE.
2.60	

NOTES

1) No groundwater seepage observed.

2) Sample taken at:
S1 0,42--0,96 (1 x Bulk)

3) Refusal depth at 2,60m.

CONTRACTOR :
MACHINE : TLB 4x4 CAT
DRILLED BY :
PROFILED BY : E. Dada Mia

TYPE SET BY : K.Kistasamy
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM :
DATE : 13 May 2020
DATE : 15 May 2020

DATE : 25/06/20 12:39
TEXT : ..C:\LOGS\PITS.TXT

ELEVATION : -
X-COORD : 30 29'22.2"E
Y-COORD : 29 26'50.6"S

HOLE No: IP47

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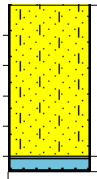
Escongweni BPH Engineers (Pty) Ltd
Proposed Water Supply Scheme at Mpolweni, KwaZulu-Natal within Umgungundlovu District Municipality

HOLE No: IP48
Sheet 1 of 1

JOB NUMBER: 085-20

Scale 1:25



0.00 Slightly moist, medium brownish red, loose, fine to medium grained, silty SAND. Residual Sandstone.

0.50 Light pinkish grey, highly weathered, fine to medium grained, highly fractured, very soft rock. SANDSTONE.

0.55

NOTES

1) No groundwater seepage observed.

2) Refusal depth at 0,55m.

CONTRACTOR :
MACHINE : TLB 4x4 CAT
DRILLED BY :
PROFILED BY : E. Dada Mia
TYPE SET BY : K.Kistasamy
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM :
DATE : 13 May 2020
DATE : 15 May 2020
DATE : 25/06/20 12:39
TEXT : ..C:\LOGS\PITS.TXT

ELEVATION : -
X-COORD : 30 29'52.4"E
Y-COORD : 29 26'45.3"S

HOLE No: IP48

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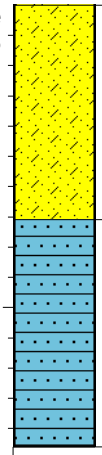
Escongweni BPH Engineers (Pty) Ltd
Proposed Water Supply Scheme at Mpolweni, KwaZulu-Natal within Umgungundlovu District Municipality

HOLE No: IP49
Sheet 1 of 1

JOB NUMBER: 085-20

Scale 1:25



0.00 Slightly moist, medium brownish red, loose to medium dense, fine to medium grained, slightly clayey SAND. Residual Sandstone.

0.71 Light pinkish grey, highly weathered, fine to medium grained, highly fractured, very soft rock. SANDSTONE.

1.46

NOTES

1) No groundwater seepage observed.

2) Refusal depth at 1,46m.

CONTRACTOR :
MACHINE : TLB 4x4 CAT
DRILLED BY :
PROFILED BY : E. Dada Mia
TYPE SET BY : K.Kistasamy
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM :
DATE : 13 May 2020
DATE : 15 May 2020
DATE : 25/06/20 12:39
TEXT : ..C:\LOGS\PITS.TXT

ELEVATION : -
X-COORD : 30 29'54.2"E
Y-COORD : 29 26'58.5"S

HOLE No: IP49

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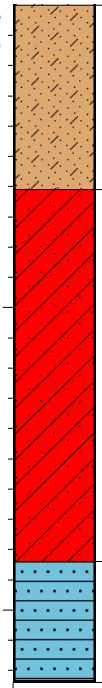
Escongweni BPH Engineers (Pty) Ltd
Proposed Water Supply Scheme at Mpolweni, KwaZulu-Natal within Umgungundlovu District Municipality

HOLE No: IP50
Sheet 1 of 1

JOB NUMBER: 085-20

Scale 1:25



0.00	Slightly moist, medium brown, loose to medium dense, fine to medium grained, slightly clayey SAND with roots. Colluvium.
0.61	Slightly moist to moist, dark red and light orange, firm to stiff, intact, sandy CLAY. Residual Sandstone.
1.84	Light orange, highly weathered, fine to medium grained, highly fractured, very soft rock. SANDSTONE.
2.24	

NOTES

1) No groundwater seepage observed.

2) Refusal depth at 2,24m.

CONTRACTOR :
MACHINE : TLB 4x4 CAT
DRILLED BY :
PROFILED BY : E. Dada Mia

TYPE SET BY : K.Kistasamy
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM :
DATE : 13 May 2020
DATE : 15 May 2020

DATE : 25/06/20 12:39
TEXT : ..C:\LOGS\PITS.TXT

ELEVATION : -
X-COORD : 30 30'10.8"E
Y-COORD : 29 26'52.9"S

HOLE No: IP50

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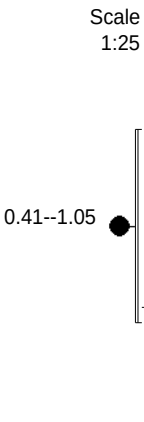
Escongweni BPH Engineers (Pty) Ltd
Proposed Water Supply Scheme at Mpolweni, KwaZulu-Natal within Umgungundlovu District Municipality

HOLE No: IP51
Sheet 1 of 1

JOB NUMBER: 085-20

Scale 1:25



0.00	Slightly moist, medium brown, loose to medium dense, fine to medium grained, slightly clayey SAND. Colluvium.
0.41	Slightly moist, light brownish red, loose to medium dense, fine to medium grained, slightly clayey SAND. Residual Sandstone.
1.05	Light pinkish grey, highly weathered, fine to medium grained, highly fractured, very soft rock. SANDSTONE.
1.24	

NOTES

1) No groundwater seepage observed.

2) Sample taken at:
S1 0,41--1,05 (1 x Bulk)

3) Refusal depth at 1,24m.

CONTRACTOR :
MACHINE : TLB 4x4 CAT
DRILLED BY :
PROFILED BY : E. Dada Mia

TYPE SET BY : K.Kistasamy
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM :
DATE : 13 May 2020
DATE : 15 May 2020

DATE : 25/06/20 12:39
TEXT : ..C:\LOGS\PITS.TXT

ELEVATION : -
X-COORD : 30 30'24.4"E
Y-COORD : 29 26'56.5"S

HOLE No: IP51

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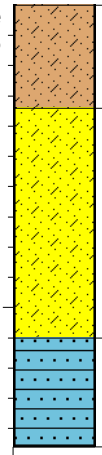
Escongweni BPH Engineers (Pty) Ltd
Proposed Water Supply Scheme at Mpolweni, KwaZulu-Natal within Umgungundlovu District Municipality

HOLE No: IP52
Sheet 1 of 1

JOB NUMBER: 085-20

Scale 1:25



0.00	Slightly moist, medium brown, loose to medium dense, fine to medium grained, slightly clayey SAND. Colluvium.
0.34	Slightly moist, light brownish red, loose to medium dense, fine to medium grained, slightly clayey SAND. Residual Sandstone.
1.10	Light pinkish grey, highly weathered, fine to medium grained, highly fractured, very soft rock. SANDSTONE.
1.46	

NOTES

1) No groundwater seepage observed.

2) Refusal depth at 1,46m.

CONTRACTOR :
MACHINE : TLB 4x4 CAT
DRILLED BY :
PROFILED BY : E. Dada Mia
TYPE SET BY : K.Kistasamy
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM :
DATE : 13 May 2020
DATE : 15 May 2020
DATE : 25/06/20 12:39
TEXT : ..C:\LOGS\PITS.TXT

ELEVATION : -
X-COORD : 30 30'26.4"E
Y-COORD : 29 27'04.4"S

HOLE No: IP52

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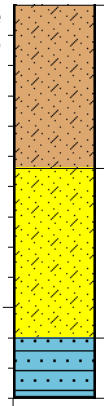
Escongweni BPH Engineers (Pty) Ltd
Proposed Water Supply Scheme at Mpolweni, KwaZulu-Natal within Umgungundlovu District Municipality

HOLE No: IP53
Sheet 1 of 1

JOB NUMBER: 085-20

Scale 1:25



0.00 — Slightly moist, medium brown, loose to medium dense, fine to medium grained, slightly clayey SAND. Colluvium.

0.54 — Slightly moist, light brownish red, loose to medium dense, fine to medium grained, slightly clayey SAND. Residual Sandstone.

1.10 — Light pinkish grey, highly weathered, fine to medium grained, highly fractured, very soft rock. SANDSTONE.

1.30

NOTES

1) No groundwater seepage observed.

2) Refusal depth at 1,30m.

CONTRACTOR :
MACHINE : TLB 4x4 CAT
DRILLED BY :
PROFILED BY : E. Dada Mia
TYPE SET BY : K.Kistasamy
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM :
DATE : 13 May 2020
DATE : 15 May 2020
DATE : 25/06/20 12:39
TEXT : ..C:\LOGS\PITS.TXT

ELEVATION : -
X-COORD : 30 30'36.0"E
Y-COORD : 29 26'48.6"S

HOLE No: IP53

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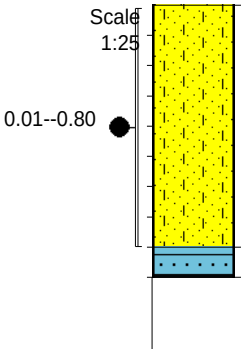
Escongweni BPH Engineers (Pty) Ltd
Proposed Water Supply Scheme at Mpolweni, KwaZulu-Natal within Umgungundlovu District Municipality

HOLE No: IP54
Sheet 1 of 1

JOB NUMBER: 085-20

Scale 1:25



0.00 Slightly moist, medium brownish red, loose to medium dense, fine to medium grained, silty SAND. Residual Sandstone.

0.80 Light pinkish grey, highly weathered, fine to medium grained, highly fractured, very soft rock. SANDSTONE.

0.90

NOTES

1) No groundwater seepage observed.

2) Sample taken at:
S1 0,01--0,80 (1 x Bulk)

3) Refusal depth at 0,90m.

CONTRACTOR :
MACHINE : TLB 4x4 CAT
DRILLED BY :
PROFILED BY : E. Dada Mia
TYPE SET BY : K.Kistasamy
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM :
DATE : 13 May 2020
DATE : 15 May 2020
DATE : 25/06/20 12:39
TEXT : ..C:\LOGS\PITS.TXT

ELEVATION : -
X-COORD : 30 30'51.1"E
Y-COORD : 29 26'50.0"S

HOLE No: IP54

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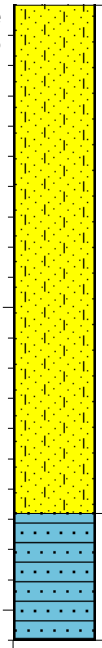
Escongweni BPH Engineers (Pty) Ltd
Proposed Water Supply Scheme at Mpolweni, KwaZulu-Natal within Umgungundlovu District Municipality

HOLE No: IP55
Sheet 1 of 1

JOB NUMBER: 085-20

Scale 1:25



0.00 Slightly moist, medium brownish red, loose to medium dense, fine to medium grained, silty SAND. Residual Sandstone.

1.68 Light pinkish grey, highly weathered, fine to medium grained, highly fractured, very soft rock. SANDSTONE.

2.10

NOTES

1) No groundwater seepage observed.

2) Refusal depth at 2,10m.

CONTRACTOR :
MACHINE : TLB 4x4 CAT
DRILLED BY :
PROFILED BY : E. Dada Mia
TYPE SET BY : K.Kistasamy
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM :
DATE : 13 May 2020
DATE : 15 May 2020
DATE : 25/06/20 12:39
TEXT : ..C:\LOGS\PITS.TXT

ELEVATION : -
X-COORD : 30 30'42.4"E
Y-COORD : 29 26'59.9"S

HOLE No: IP55

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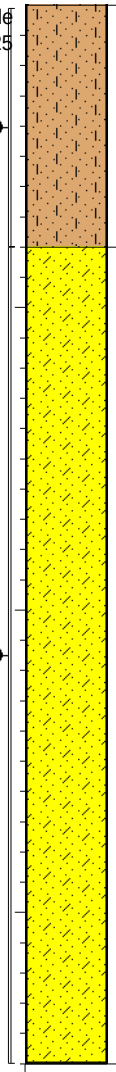
Escongweni BPH Engineers (Pty) Ltd
Proposed Water Supply Scheme at Mpolweni, KwaZulu-Natal within Umgungundlovu District Municipality

HOLE No: IP56
Sheet 1 of 1

JOB NUMBER: 085-20

Scale 1:25



0.00 Slightly moist, medium orange brown, loose to medium dense, fine to medium grained, silty SAND. Colluvium.

0.01--0.80

0.80 Slightly moist, light red, loose, fine to medium grained, slightly clayey SAND with sandstone fragments. Residual Sandstone.

0.80--3.50

3.50

NOTES

1) No groundwater seepage observed.

2) Samples taken at:
S1 0,01--0,80 (1 x Bulk)
S2 0,80--3,50 (1 x Bulk)

3) Final depth at 3,50m.

CONTRACTOR :
MACHINE : TLB 4x4 CAT
DRILLED BY :
PROFILED BY : E. Dada Mia
TYPE SET BY : K.Kistasamy
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM :
DATE : 13 May 2020
DATE : 15 May 2020
DATE : 25/06/20 12:39
TEXT : ..C:\LOGS\PITS.TXT

ELEVATION : -
X-COORD : 30 30'52.1"E
Y-COORD : 29 27'04.9"S

HOLE No: IP56

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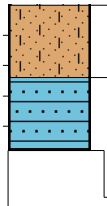
Escongweni BPH Engineers (Pty) Ltd
Proposed Water Supply Scheme at Mpolweni, KwaZulu-Natal within Umgungundlovu District Municipality

HOLE No: IP57
Sheet 1 of 1

JOB NUMBER: 085-20

Scale 1:25



0.00 Slightly moist, medium brownish grey, loose to medium dense, fine to medium grained, silty SAND. Colluvium.

0.24 Light pinkish grey, highly weathered, fine to medium grained, highly fractured, very soft rock. SANDSTONE.

0.48

NOTES

1) No groundwater seepage observed.

2) Refusal depth at 0,48m.

CONTRACTOR :
MACHINE : TLB 4x4 CAT
DRILLED BY :
PROFILED BY : E. Dada Mia
TYPE SET BY : K.Kistasamy
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM :
DATE : 13 May 2020
DATE : 15 May 2020
DATE : 25/06/20 12:39
TEXT : ..C:\LOGS\PITS.TXT

ELEVATION : -
X-COORD : 30 31'58.9"E
Y-COORD : 29 27'12.7"S

HOLE No: IP57

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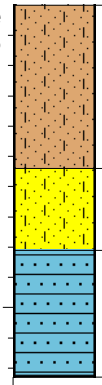
Escongweni BPH Engineers (Pty) Ltd
Proposed Water Supply Scheme at Mpolweni, KwaZulu-Natal within Umgungundlovu District Municipality

HOLE No: IP58
Sheet 1 of 1

JOB NUMBER: 085-20

Scale 1:25



0.00	Slightly moist, medium brown, loose to medium dense, fine to medium grained, silty SAND. Colluvium.
0.54	Slightly moist, medium brownish orange, loose to medium dense, fine to medium grained, silty SAND. Residual Sandstone.
0.81	Light greyish orange, highly weathered, fine to medium grained, highly fractured, very soft rock. SANDSTONE.
1.23	

NOTES

1) No groundwater seepage observed.

2) Refusal depth at1,23m.

CONTRACTOR :
MACHINE : TLB 4x4 CAT
DRILLED BY :
PROFILED BY : E. Dada Mia
TYPE SET BY : K.Kistasamy
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM :
DATE : 13 May 2020
DATE : 15 May 2020
DATE : 25/06/20 12:39
TEXT : ..C:\LOGS\PITS.TXT

ELEVATION : -
X-COORD : 30 31'09.4"E
Y-COORD : 29 27'14.7"S

HOLE No: IP58

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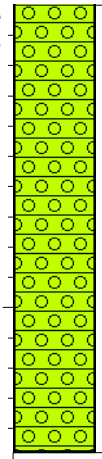
Escongweni BPH Engineers (Pty) Ltd
Proposed Water Supply Scheme at Mpolweni, KwaZulu-Natal within Umgungundlovu District Municipality

HOLE No: EXP1
Sheet 1 of 1

JOB NUMBER: 085-20

Scale 1:25



0.00 Dark bluish grey stained rusty brownish yellow, highly weathered, fine to medium grained, highly fractured, very soft rock containing oval and subrounded corestones. TILLITE.

1.48

NOTES

1) No groundwater seepage observed.

2) Final depth at 1,48m.

CONTRACTOR :
MACHINE : -
DRILLED BY :
PROFILED BY : E. Dada Mia

TYPE SET BY : K.Kistasamy
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM :
DATE : 13 May 2020
DATE : 15 May 2020

DATE : 25/06/20 12:39
TEXT : ..C:\LOGS\PITS.TXT

ELEVATION : -
X-COORD : 30 29'26.3"E
Y-COORD : 29 26'29.9"S

HOLE No: EXP1

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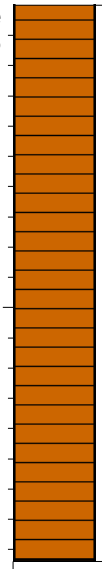
Escongweni BPH Engineers (Pty) Ltd
Proposed Water Supply Scheme at Mpolweni, KwaZulu-Natal within Umgungundlovu District Municipality

HOLE No: EXP2
Sheet 1 of 1

JOB NUMBER: 085-20

Scale 1:25



0.00 Dark bluish grey stained rusty brown, highly weathered, highly fractured, very soft rock. SHALE.

1.84

NOTES

1) No groundwater seepage observed.

2) Final depth at 1,84m.

CONTRACTOR :
MACHINE : -
DRILLED BY :
PROFILED BY : E. Dada Mia

TYPE SET BY : K.Kistasamy
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM :
DATE : 13 May 2020
DATE : 15 May 2020

DATE : 25/06/20 12:39
TEXT : ..C:\LOGS\PITS.TXT

ELEVATION : -
X-COORD : 30 28'43.0"E
Y-COORD : 29 24'13.1"S

HOLE No: EXP2

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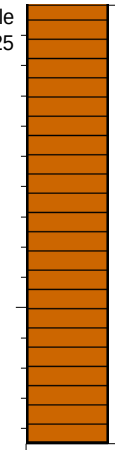
Escongweni BPH Engineers (Pty) Ltd
Proposed Water Supply Scheme at Mpolweni, KwaZulu-Natal within Umgungundlovu District Municipality

HOLE No: EXP3
Sheet 1 of 1

JOB NUMBER: 085-20

Scale 1:25



0.00 Light grey stained rusty brown, highly weathered, highly fractured, very soft rock. SHALE.

1.45

NOTES

1) No groundwater seepage observed.

2) Final depth at 1,45m.

CONTRACTOR :
MACHINE : -
DRILLED BY :
PROFILED BY : E. Dada Mia

TYPE SET BY : K.Kistasamy
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM :
DATE : 13 May 2020
DATE : 15 May 2020

DATE : 25/06/20 12:39
TEXT : ..C:\LOGS\PITS.TXT

ELEVATION : -
X-COORD : 30 28'46.0"E
Y-COORD : 29 24'17.8"S

HOLE No: EXP3

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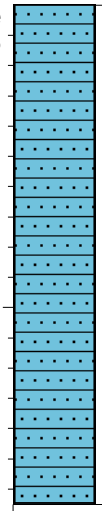
Escongweni BPH Engineers (Pty) Ltd
Proposed Water Supply Scheme at Mpolweni, KwaZulu-Natal within Umgungundlovu District Municipality

HOLE No: EXP4
Sheet 1 of 1

JOB NUMBER: 085-20

Scale 1:25



0.00 Light pinkish grey, highly weathered, fine to medium grained, highly fractured, very soft rock. SANDSTONE.

1.65

NOTES

1) No groundwater seepage observed.

2) Final depth at 1,65m.

CONTRACTOR :
MACHINE : -
DRILLED BY :
PROFILED BY : E. Dada Mia

TYPE SET BY : K.Kistasamy
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM :
DATE : 13 May 2020
DATE : 15 May 2020

DATE : 25/06/20 12:39
TEXT : ..C:\LOGS\PITS.TXT

ELEVATION : -
X-COORD : 30 30'11.4"E
Y-COORD : 29 24'50.8"S

HOLE No: EXP4

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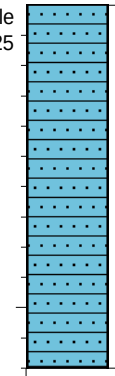
Escongweni BPH Engineers (Pty) Ltd
Proposed Water Supply Scheme at Mpolweni, KwaZulu-Natal within Umgungundlovu District Municipality

HOLE No: EXP5
Sheet 1 of 1

JOB NUMBER: 085-20

Scale 1:25



0.00 Light pinkish grey, highly weathered, fine to medium grained, highly fractured, very soft rock. SANDSTONE.

1.20

NOTES

1) No groundwater seepage observed.

2) Final depth at 1,20m.

CONTRACTOR :
MACHINE : -
DRILLED BY :
PROFILED BY : E. Dada Mia

TYPE SET BY : K.Kistasamy
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM :
DATE : 13 May 2020
DATE : 15 May 2020

DATE : 25/06/20 12:39
TEXT : ..C:\LOGS\PITS.TXT

ELEVATION : -
X-COORD : 30 30'11.5"E
Y-COORD : 29 24'50.0"S

HOLE No: EXP5

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Escongweni BPH Engineers (Pty) Ltd
Proposed Water Supply Scheme at Mpolweni, KwaZulu-Natal within Umgungundlovu District Municipality

HOLE No: EXP6
Sheet 1 of 1

JOB NUMBER: 085-20

Scale 1:25

0.00 Light pinkish grey, highly weathered, fine to medium grained, highly fractured, very soft rock. SANDSTONE.

0.28

NOTES

1) No groundwater seepage observed.

2) Final depth at 0,28m.

CONTRACTOR :
MACHINE : -
DRILLED BY :
PROFILED BY : E. Dada Mia

TYPE SET BY : K.Kistasamy
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM :
DATE : 13 May 2020
DATE : 15 May 2020

DATE : 25/06/20 12:39
TEXT : ..C:\LOGS\PITS.TXT

ELEVATION : -
X-COORD : 30 30'12.6"E
Y-COORD : 29 24'47.9"S

HOLE No: EXP6

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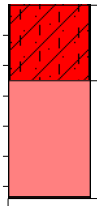
Escongweni BPH Engineers (Pty) Ltd
Proposed Water Supply Scheme at Mpolweni, KwaZulu-Natal within Umgungundlovu District Municipality

HOLE No: EXP7
Sheet 1 of 1

JOB NUMBER: 085-20

Scale 1:25



0.00	Slightly moist, dark greyish brown, firm to stiff, fissured, sandy silty CLAY. Residual Gneiss.
0.25	Light yellowish orange, highly weathered, fine to coarse grained, highly fractured, very soft rock. GNEISS.
0.64	

NOTES

1) No groundwater seepage observed.

2) Final depth at 0,64m.

CONTRACTOR :
MACHINE : -
DRILLED BY :
PROFILED BY : E. Dada Mia

INCLINATION :
DIAM :
DATE : 13 May 2020
DATE : 15 May 2020

ELEVATION : -
X-COORD : 30 30'06.4"E
Y-COORD : 29 24'53.6"S

TYPE SET BY : K.Kistasamy
SETUP FILE : STANDARD.SET

DATE : 25/06/20 12:39
TEXT : ..C:\LOGS\PITS.TXT

HOLE No: EXP7

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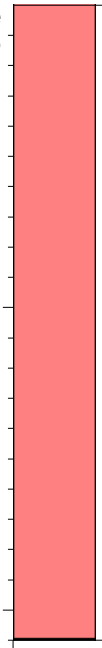
Proposed Water Supply Scheme at Mpolweni, KwaZulu-Natal within Umgungundlovu District Municipality

HOLE No: EXP8
Sheet 1 of 1

JOB NUMBER: 085-20

Scale 1:25



0.00 Light yellowish orange, highly to moderately weathered, fine to coarse grained, highly to moderately fractured, very soft rock. GNEISS.

2.10

NOTES

1) No groundwater seepage observed.

2) Final depth at 2,10m.

CONTRACTOR :
MACHINE : -
DRILLED BY :
PROFILED BY : E. Dada Mia

TYPE SET BY : K.Kistasamy
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM :
DATE : 13 May 2020
DATE : 15 May 2020

DATE : 25/06/20 12:39
TEXT : ..C:\LOGS\PITS.TXT

ELEVATION : -
X-COORD : 30 29'55.3"E
Y-COORD : 29 24'44.5"S

HOLE No: EXP8

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Escongweni BPH Engineers (Pty) Ltd
Proposed Water Supply Scheme at Mpolweni, KwaZulu-Natal within Umgungundlovu District Municipality

HOLE No: EXP9
Sheet 1 of 1

JOB NUMBER: 085-20

Scale 1:25

0.00 Light pinkish grey, highly weathered, fine to medium grained, highly fractured, very soft rock. SANDSTONE.

0.20

NOTES

1) No groundwater seepage observed.

2) On the surface.

3) Final depth at 0,20m.

CONTRACTOR :
MACHINE : -
DRILLED BY :
PROFILED BY : E. Dada Mia

TYPE SET BY : K.Kistasamy
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM :
DATE : 13 May 2020
DATE : 15 May 2020

DATE : 25/06/20 12:39
TEXT : ..C:\LOGS\PITS.TXT

ELEVATION : -
X-COORD : 30 29'48.0"E
Y-COORD : 29 26'47.1"S

HOLE No: EXP9

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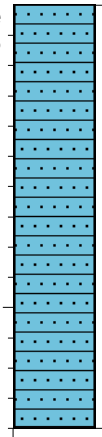
Escongweni BPH Engineers (Pty) Ltd
Proposed Water Supply Scheme at Mpolweni, KwaZulu-Natal within Umgungundlovu District Municipality

HOLE No: EXP10
Sheet 1 of 1

JOB NUMBER: 085-20

Scale 1:25



0.00 Light pinkish grey, highly weathered, fine to medium grained, highly fractured, very soft rock. SANDSTONE.

1.40

NOTES

1) No groundwater seepage observed.

2) Final depth at 1,40m.

CONTRACTOR :
MACHINE : -
DRILLED BY :
PROFILED BY : E. Dada Mia

TYPE SET BY : K.Kistasamy
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM :
DATE : 13 May 2020
DATE : 15 May 2020

DATE : 25/06/20 12:39
TEXT : ..C:\LOGS\PITS.TXT

ELEVATION : -
X-COORD : 30 30' 12.7"E
Y-COORD : 29 27' 00.0"S

HOLE No: EXP10

APPENDIX B

CBR DYNAMIC CONE PENETROMETER (DCP) TEST RESULTS (PIPELINE; 3ML RESERVOIR; 200KL ELEVATED TANK)

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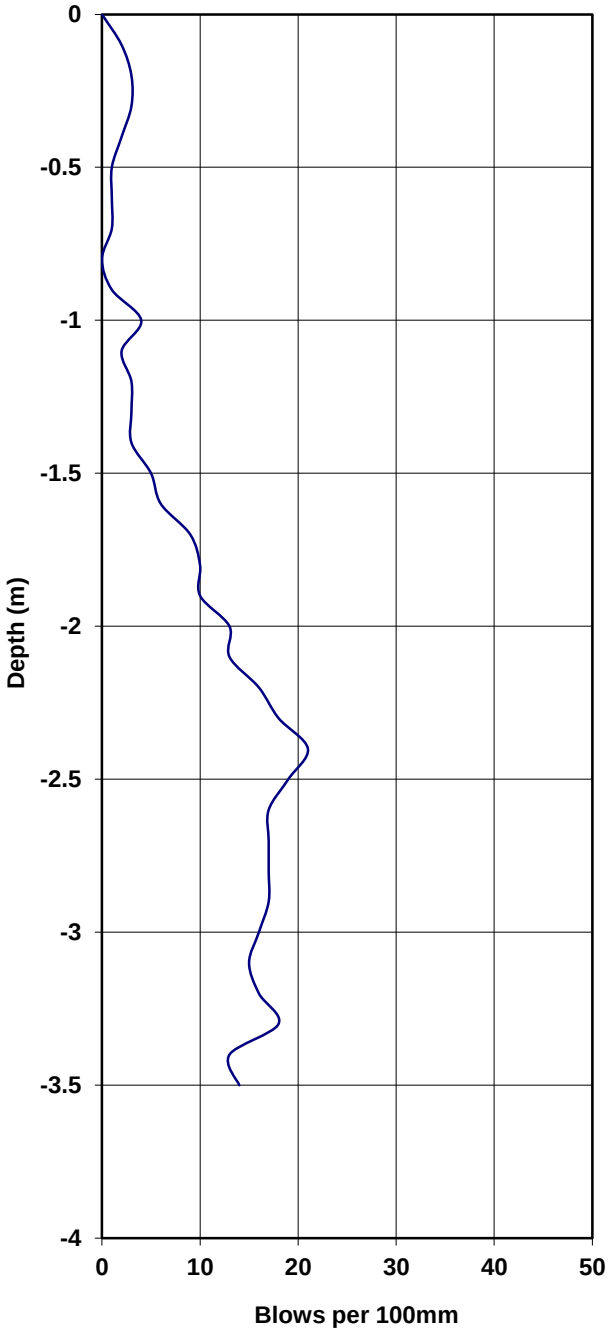
Project: Proposed Water Supply Scheme at Mpolweni **Date:** 15.05.2020

Section: Umgungundlovu District Municipality **Operator:** E.Dada-Mia

CBR Penetrometer Probe ---------- Test No. DC 1

THE STRENGTH AND CBR VALUES ARE EMPIRICAL AND DEPEND ON FACTORS SUCH AS MOISTURE CONTENT WHICH HAVE NOT BEEN DETERMINED. THEY ARE THEREFORE INDICATIVE ONLY AND SHOULD BE VERIFIED BY TEST OR OBSERVATION

Depth (m)	Blows/ 100mm	Inferred Consistency	Shear Strength	CBR %
0				
0.1	2	Loose	<30 deg	3
0.2	3	Loose	<30 deg	5
0.3	3	Loose	<30 deg	5
0.4	2	Loose	<30 deg	3
0.5	1	Very Loose	<29 deg	2
0.6	1	Very Loose	<29 deg	2
0.7	1	Very Loose	<29 deg	2
0.8	0	V.V.Loose	<28 deg	<2
0.9	1	Very Loose	<29 deg	2
1	4	Med.Dense	30 deg	7
1.1	2	Loose	<30 deg	3
1.2	3	Loose	<30 deg	5
1.3	3	Loose	<30 deg	5
1.4	3	Loose	<30 deg	5
1.5	5	Med.Dense	32 deg	8
1.6	6	Med.Dense	33 deg	10
1.7	9	Med.Dense	35 deg	15
1.8	10	Med.Dense	36 deg	17
1.9	10	Med.Dense	36 deg	17
2	13	Dense	37 deg	23
2.1	13	Dense	37 deg	23
2.2	16	Dense	37 deg	29
2.3	18	Dense	37 deg	33
2.4	21	Dense	38 deg	40
2.5	19	Dense	37 deg	35
2.6	17	Dense	37 deg	31
2.7	17	Dense	37 deg	31
2.8	17	Dense	37 deg	31
2.9	17	Dense	37 deg	31
3	16	Dense	37 deg	29
3.1	15	Dense	37 deg	27
3.2	16	Dense	37 deg	29
3.3	18	Dense	37 deg	33
3.4	13	Dense	37 deg	23
3.5	14	Dense	37 deg	25
	End			



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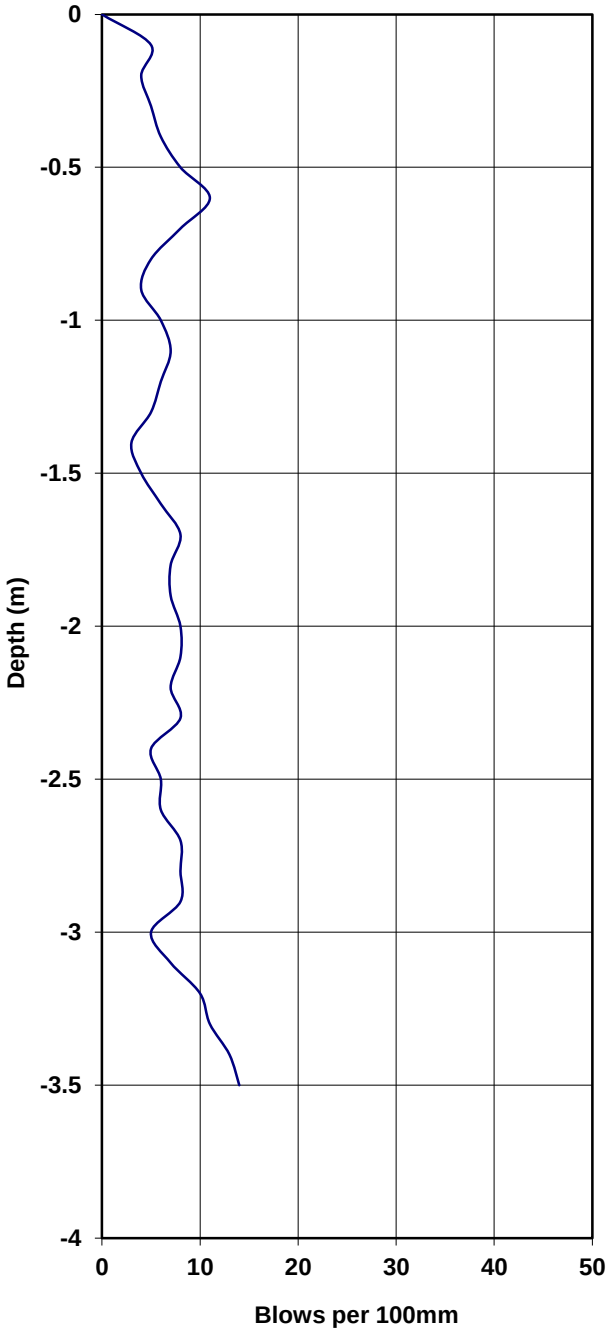
CBR Penetrometer Probe ---------- Test No. DC 2

THE STRENGTH AND CBR VALUES ARE EMPIRICAL AND DEPEND ON FACTORS SUCH AS MOISTURE CONTENT WHICH HAVE NOT BEEN DETERMINED. THEY ARE THEREFORE INDICATIVE ONLY AND SHOULD BE VERIFIED BY TEST OR OBSERVATION

Depth (m)	Blows/ 100mm	Inferred Consistency	Shear Strength	CBR %
0				
0.1	5	Med.Dense	32 deg	8
0.2	4	Med.Dense	30 deg	7
0.3	5	Med.Dense	32 deg	8
0.4	6	Med.Dense	33 deg	10
0.5	8	Med.Dense	35 deg	14
0.6	11	Dense	36 deg	19
0.7	8	Med.Dense	35 deg	14
0.8	5	Med.Dense	32 deg	8
0.9	4	Med.Dense	30 deg	7
1	6	Med.Dense	33 deg	10
1.1	7	Med.Dense	34 deg	12
1.2	6	Med.Dense	33 deg	10
1.3	5	Med.Dense	32 deg	8
1.4	3	Loose	<30 deg	5
1.5	4	Med.Dense	30 deg	7
1.6	6	Med.Dense	33 deg	10
1.7	8	Med.Dense	35 deg	14
1.8	7	Med.Dense	34 deg	12
1.9	7	Med.Dense	34 deg	12
2	8	Med.Dense	35 deg	14
2.1	8	Med.Dense	35 deg	14
2.2	7	Med.Dense	34 deg	12
2.3	8	Med.Dense	35 deg	14
2.4	5	Med.Dense	32 deg	8
2.5	6	Med.Dense	33 deg	10
2.6	6	Med.Dense	33 deg	10
2.7	8	Med.Dense	35 deg	14
2.8	8	Med.Dense	35 deg	14
2.9	8	Med.Dense	35 deg	14
3	5	Med.Dense	32 deg	8
3.1	7	Med.Dense	34 deg	12
3.2	10	Med.Dense	36 deg	17
3.3	11	Dense	36 deg	19
3.4	13	Dense	37 deg	23
3.5	14	Dense	37 deg	25
	End			



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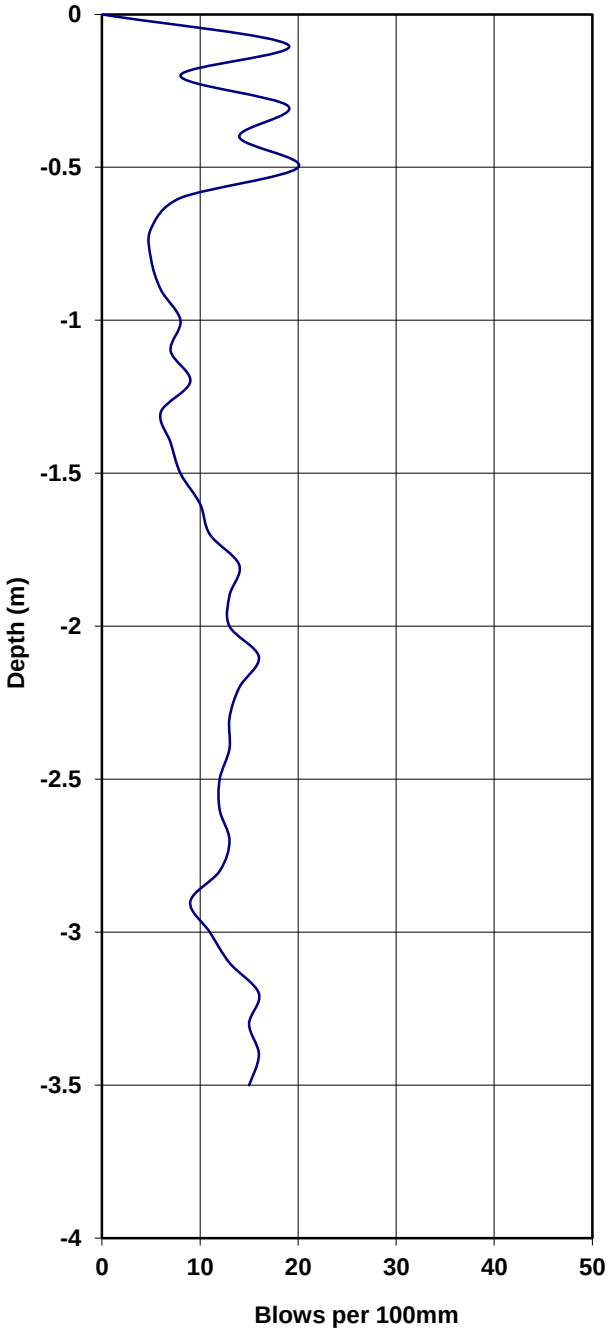
Section: Umgungundlovu District Municipality **Operator:** E.Dada-Mia

CBR Penetrometer Probe ---------- Test No. DC 3

THE STRENGTH AND CBR VALUES ARE EMPIRICAL AND DEPEND ON FACTORS SUCH AS MOISTURE CONTENT WHICH HAVE NOT BEEN DETERMINED. THEY ARE THEREFORE INDICATIVE ONLY AND SHOULD BE VERIFIED BY TEST OR OBSERVATION

Depth (m)	Blows/ 100mm	Inferred Consistency	Shear Strength	CBR %
0				
0.1	19	Dense	37 deg	35
0.2	8	Med.Dense	35 deg	14
0.3	19	Dense	37 deg	35
0.4	14	Dense	37 deg	25
0.5	20	Dense	38 deg	37
0.6	8	Med.Dense	35 deg	14
0.7	5	Med.Dense	32 deg	8
0.8	5	Med.Dense	32 deg	8
0.9	6	Med.Dense	33 deg	10
1	8	Med.Dense	35 deg	14
1.1	7	Med.Dense	34 deg	12
1.2	9	Med.Dense	35 deg	15
1.3	6	Med.Dense	33 deg	10
1.4	7	Med.Dense	34 deg	12
1.5	8	Med.Dense	35 deg	14
1.6	10	Med.Dense	36 deg	17
1.7	11	Dense	36 deg	19
1.8	14	Dense	37 deg	25
1.9	13	Dense	37 deg	23
2	13	Dense	37 deg	23
2.1	16	Dense	37 deg	29
2.2	14	Dense	37 deg	25
2.3	13	Dense	37 deg	23
2.4	13	Dense	37 deg	23
2.5	12	Dense	36 deg	21
2.6	12	Dense	36 deg	21
2.7	13	Dense	37 deg	23
2.8	12	Dense	36 deg	21
2.9	9	Med.Dense	35 deg	15
3	11	Dense	36 deg	19
3.1	13	Dense	37 deg	23
3.2	16	Dense	37 deg	29
3.3	15	Dense	37 deg	27
3.4	16	Dense	37 deg	29
3.5	15	Dense	37 deg	27
	End			



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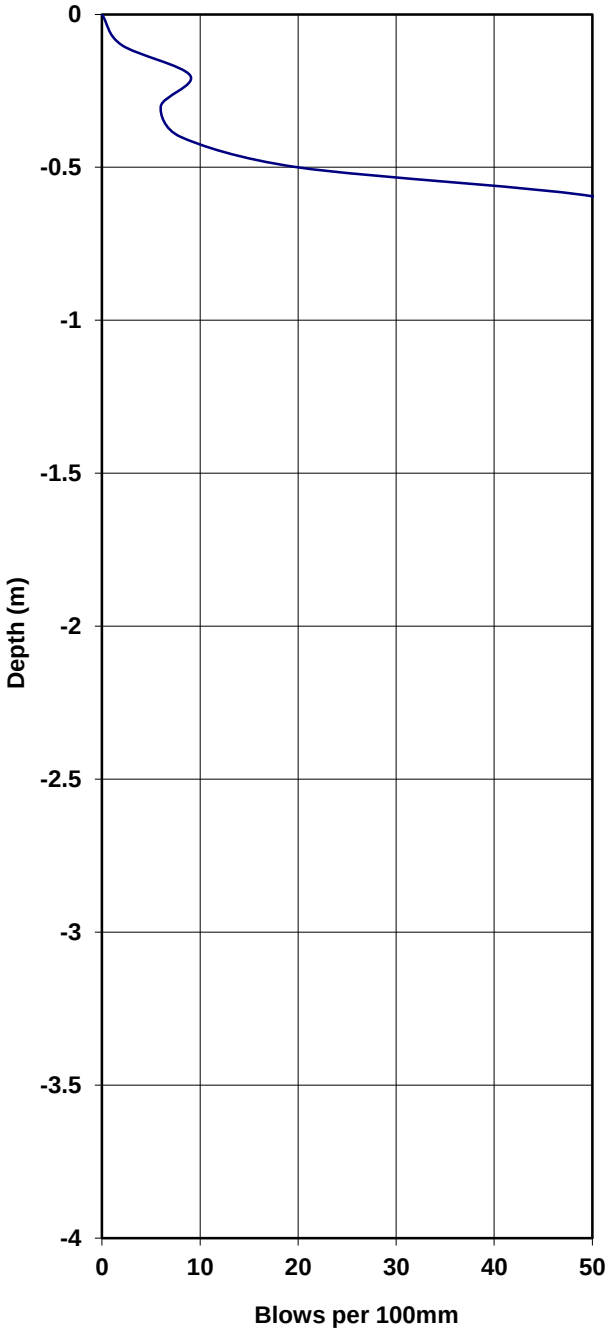
Project: Proposed Water Supply Scheme at Mpolweni **Date:** 15.05.2020

Section: Umgungundlovu District Municipality **Operator:** E.Dada-Mia

CBR Penetrometer Probe ---------- Test No. DC 4

THE STRENGTH AND CBR VALUES ARE EMPIRICAL AND DEPEND ON FACTORS SUCH AS MOISTURE CONTENT WHICH HAVE NOT BEEN DETERMINED. THEY ARE THEREFORE INDICATIVE ONLY AND SHOULD BE VERIFIED BY TEST OR OBSERVATION

Depth (m)	Blows/ 100mm	Inferred Consistency	Shear Strength	CBR %
0				
0.1	2	Loose	<30 deg	3
0.2	9	Med.Dense	35 deg	15
0.3	6	Med.Dense	33 deg	10
0.4	8	Med.Dense	35 deg	14
0.5	20	Dense	38 deg	37
	Refusal			



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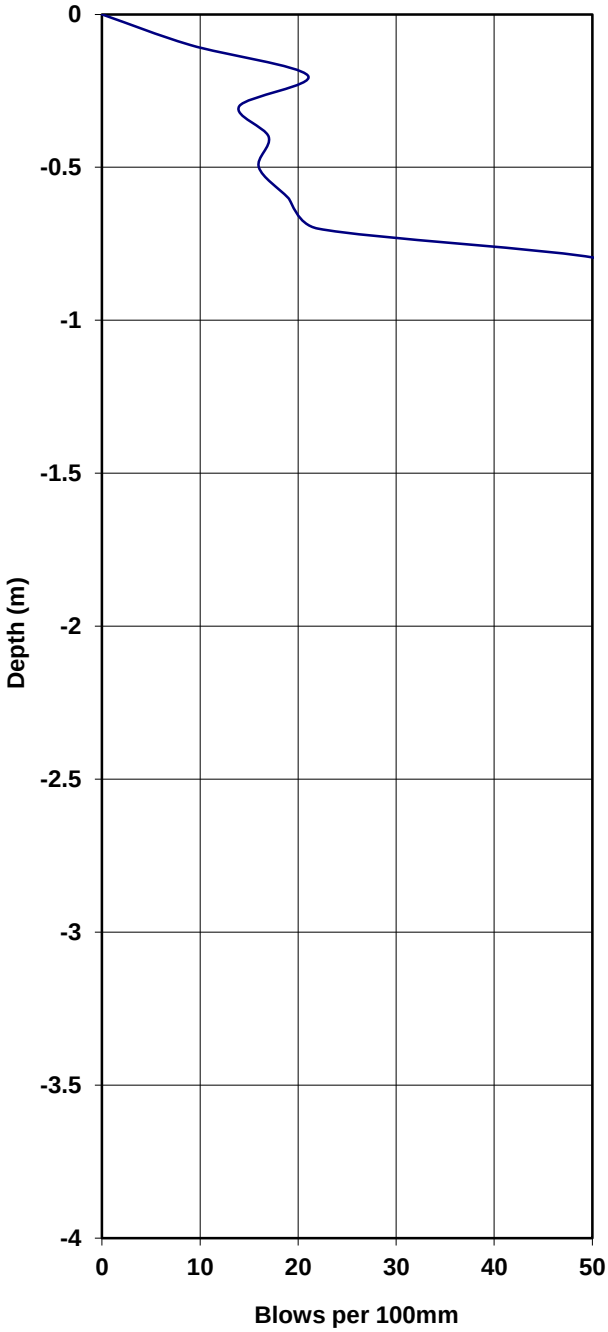
Project: Proposed Water Supply Scheme at Mpolweni **Date:** 15.05.2020

Section: Umgungundlovu District Municipality **Operator:** E.Dada-Mia

CBR Penetrometer Probe ---------- Test No. DC 5

THE STRENGTH AND CBR VALUES ARE EMPIRICAL AND DEPEND ON FACTORS SUCH AS MOISTURE CONTENT WHICH HAVE NOT BEEN DETERMINED. THEY ARE THEREFORE INDICATIVE ONLY AND SHOULD BE VERIFIED BY TEST OR OBSERVATION

Depth (m)	Blows/ 100mm	Inferred Consistency	Shear Strength	CBR %
0				
0.1	9	Med.Dense	35 deg	15
0.2	21	Dense	38 deg	40
0.3	14	Dense	37 deg	25
0.4	17	Dense	37 deg	31
0.5	16	Dense	37 deg	29
0.6	19	Dense	37 deg	35
0.7	22	Dense	38 deg	42
	Refusal			



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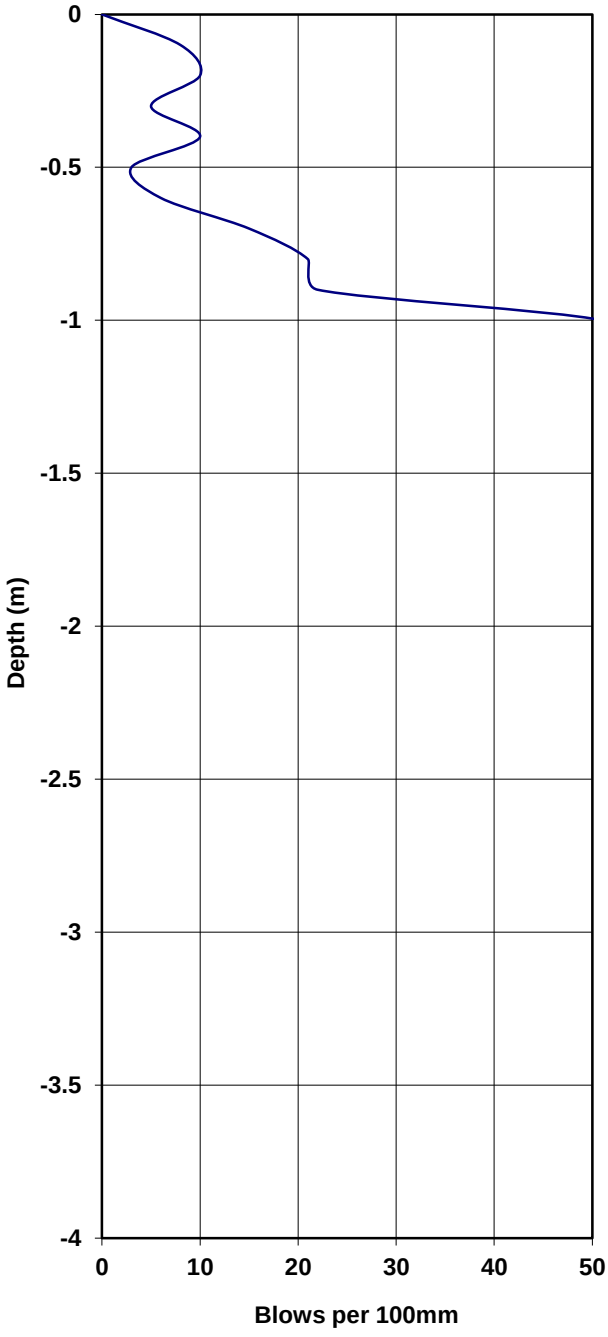
Section: Umgungundlovu District Municipality **Operator:** E.Dada-Mia

CBR Penetrometer Probe ---------- Test No. DC 6

THE STRENGTH AND CBR VALUES ARE EMPIRICAL AND DEPEND ON FACTORS SUCH AS MOISTURE CONTENT WHICH HAVE NOT BEEN DETERMINED. THEY ARE THEREFORE INDICATIVE ONLY AND SHOULD BE VERIFIED BY TEST OR OBSERVATION

Depth (m)	Blows/ 100mm	Inferred Consistency	Shear Strength	CBR %
0				
0.1	8	Med.Dense	35 deg	14
0.2	10	Med.Dense	36 deg	17
0.3	5	Med.Dense	32 deg	8
0.4	10	Med.Dense	36 deg	17
0.5	3	Loose	<30 deg	5
0.6	6	Med.Dense	33 deg	10
0.7	15	Dense	37 deg	27
0.8	21	Dense	38 deg	40
0.9	22	Dense	38 deg	42
	Refusal			



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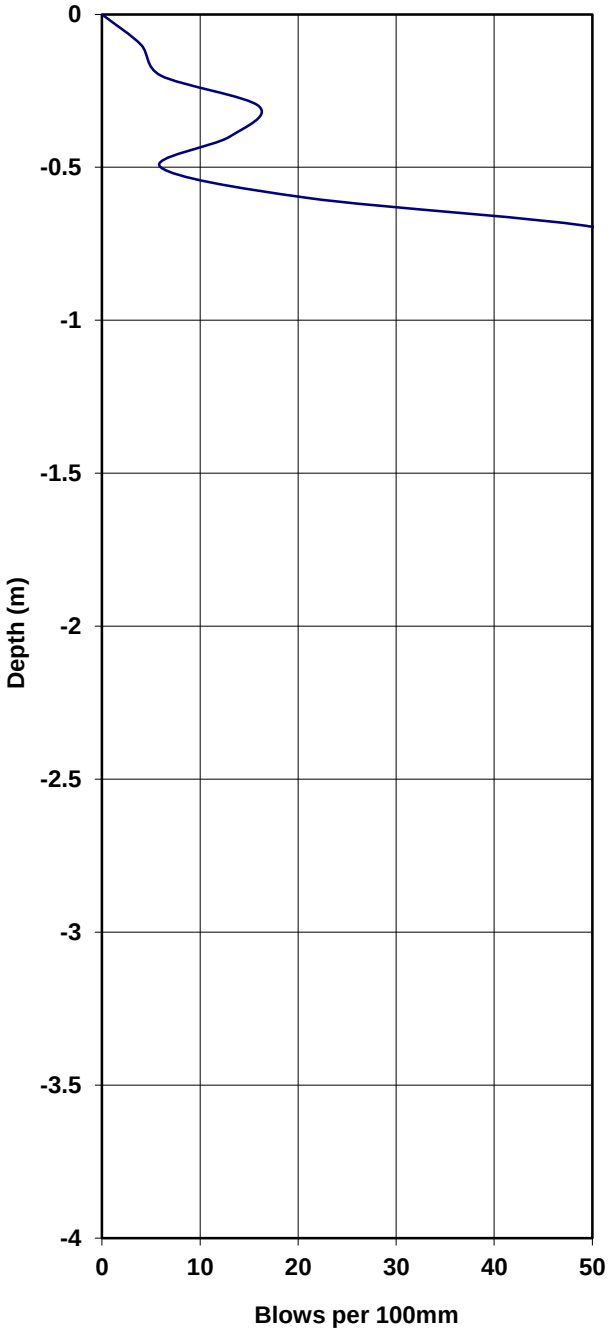
Project: Proposed Water Supply Scheme at Mpolweni **Date:** 15.05.2020

Section: Umgungundlovu District Municipality **Operator:** E.Dada-Mia

CBR Penetrometer Probe ---------- Test No. DC 7

THE STRENGTH AND CBR VALUES ARE EMPIRICAL AND DEPEND ON FACTORS SUCH AS MOISTURE CONTENT WHICH HAVE NOT BEEN DETERMINED. THEY ARE THEREFORE INDICATIVE ONLY AND SHOULD BE VERIFIED BY TEST OR OBSERVATION

Depth (m)	Blows/ 100mm	Inferred Consistency	Shear Strength	CBR %
0				
0.1	4	Med.Dense	30 deg	7
0.2	6	Med.Dense	33 deg	10
0.3	16	Dense	37 deg	29
0.4	13	Dense	37 deg	23
0.5	6	Med.Dense	33 deg	10
0.6	21	Dense	38 deg	40
	Refusal			



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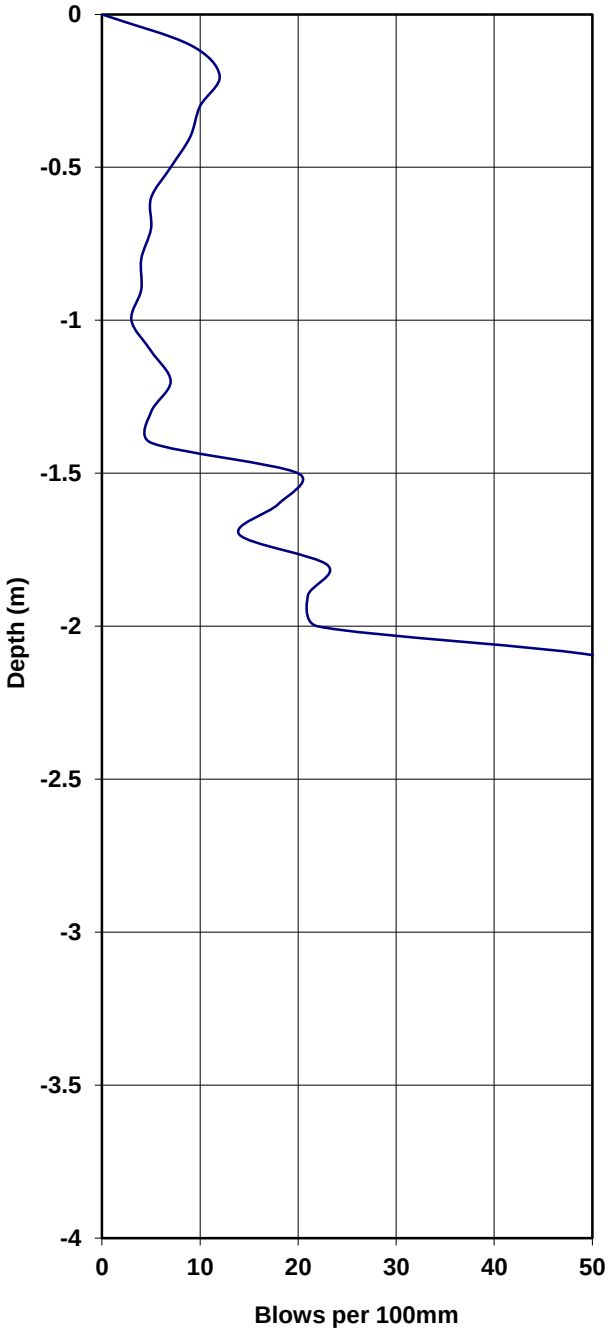
Project: Proposed Water Supply Scheme at Mpolweni **Date:** 15.05.2020

Section: Umgungundlovu District Municipality **Operator:** E.Dada-Mia

CBR Penetrometer Probe ---------- Test No. DC 8

THE STRENGTH AND CBR VALUES ARE EMPIRICAL AND DEPEND ON FACTORS SUCH AS MOISTURE CONTENT WHICH HAVE NOT BEEN DETERMINED. THEY ARE THEREFORE INDICATIVE ONLY AND SHOULD BE VERIFIED BY TEST OR OBSERVATION

Depth (m)	Blows/ 100mm	Inferred Consistency	Shear Strength	CBR %
0				
0.1	9	Med.Dense	35 deg	15
0.2	12	Dense	36 deg	21
0.3	10	Med.Dense	36 deg	17
0.4	9	Med.Dense	35 deg	15
0.5	7	Med.Dense	34 deg	12
0.6	5	Med.Dense	32 deg	8
0.7	5	Med.Dense	32 deg	8
0.8	4	Med.Dense	30 deg	7
0.9	4	Med.Dense	30 deg	7
1	3	Loose	<30 deg	5
1.1	5	Med.Dense	32 deg	8
1.2	7	Med.Dense	34 deg	12
1.3	5	Med.Dense	32 deg	8
1.4	5	Med.Dense	32 deg	8
1.5	20	Dense	38 deg	37
1.6	18	Dense	37 deg	33
1.7	14	Dense	37 deg	25
1.8	23	Dense	38 deg	44
1.9	21	Dense	38 deg	40
2	22	Dense	38 deg	42
	Refusal			



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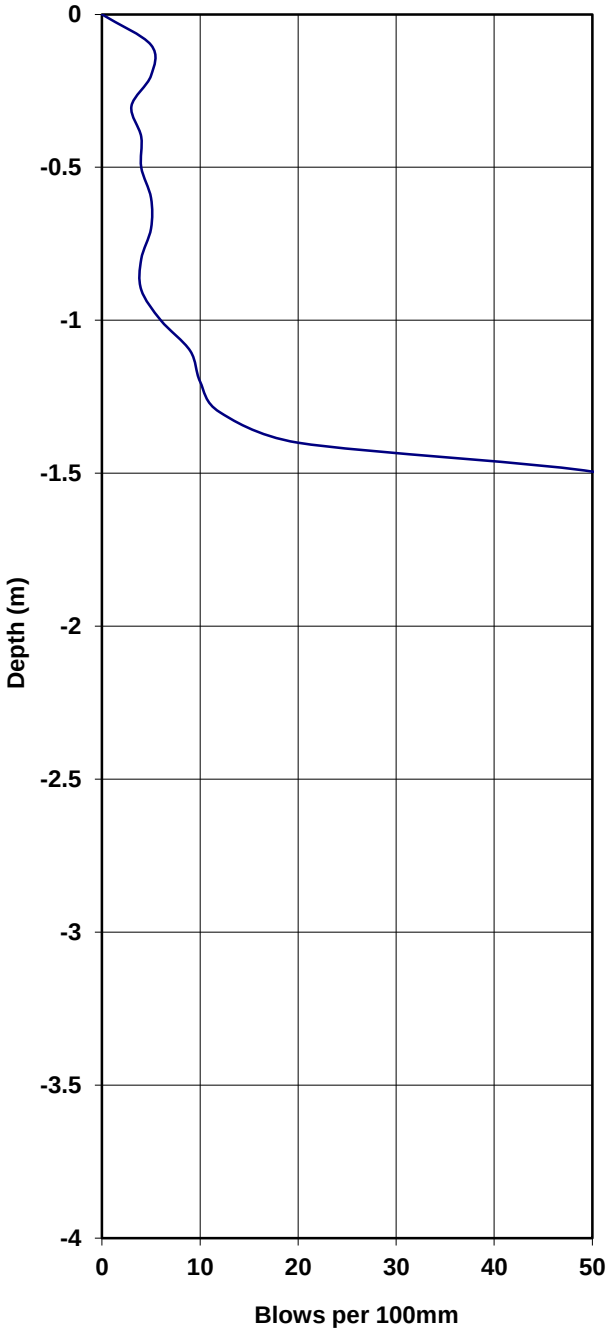
Project: Proposed Water Supply Scheme at Mpolweni **Date:** 15.05.2020

Section: Umgungundlovu District Municipality **Operator:** E.Dada-Mia

CBR Penetrometer Probe ---------- Test No. DC 9

THE STRENGTH AND CBR VALUES ARE EMPIRICAL AND DEPEND ON FACTORS SUCH AS MOISTURE CONTENT WHICH HAVE NOT BEEN DETERMINED. THEY ARE THEREFORE INDICATIVE ONLY AND SHOULD BE VERIFIED BY TEST OR OBSERVATION

Depth (m)	Blows/ 100mm	Inferred Consistency	Shear Strength	CBR %
0				
0.1	5	Med.Dense	32 deg	8
0.2	5	Med.Dense	32 deg	8
0.3	3	Loose	<30 deg	5
0.4	4	Med.Dense	30 deg	7
0.5	4	Med.Dense	30 deg	7
0.6	5	Med.Dense	32 deg	8
0.7	5	Med.Dense	32 deg	8
0.8	4	Med.Dense	30 deg	7
0.9	4	Med.Dense	30 deg	7
1	6	Med.Dense	33 deg	10
1.1	9	Med.Dense	35 deg	15
1.2	10	Med.Dense	36 deg	17
1.3	12	Stiff	100 kPa	21
1.4	20	Very Stiff	>150 kPa	37
	Refusal			



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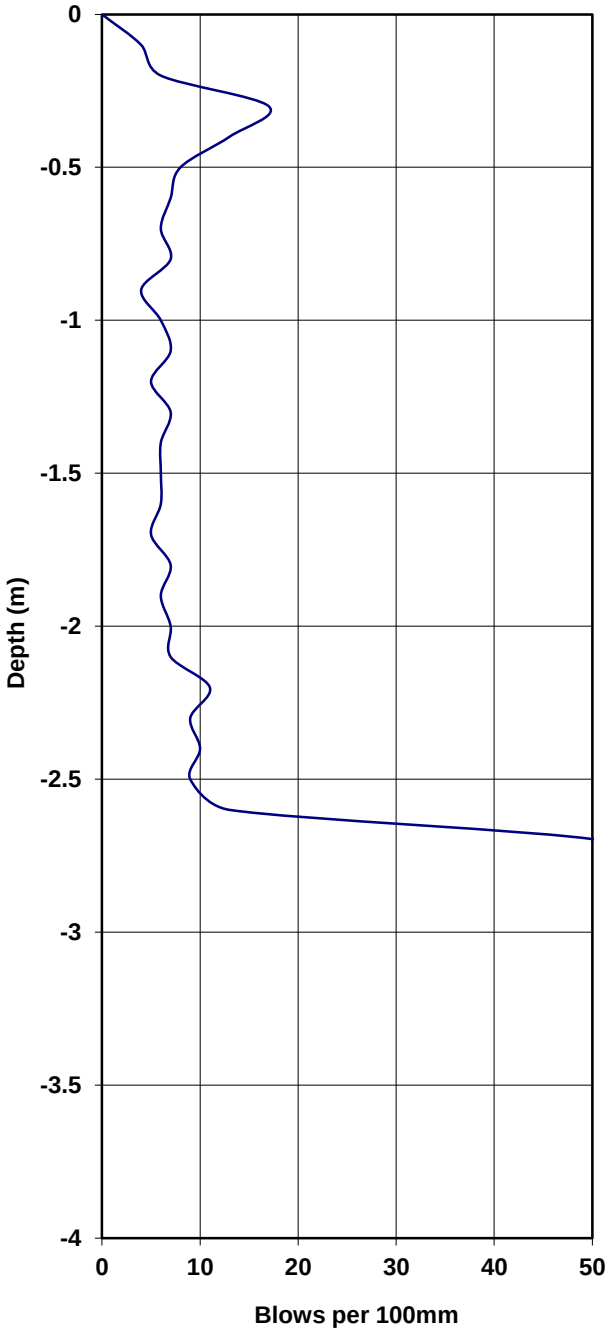
Project: Proposed Water Supply Scheme at Mpolweni **Date:** 15.05.2020

Section: Umgungundlovu District Municipality **Operator:** E.Dada-Mia

CBR Penetrometer Probe ---------- Test No. DC 10

THE STRENGTH AND CBR VALUES ARE EMPIRICAL AND DEPEND ON FACTORS SUCH AS MOISTURE CONTENT WHICH HAVE NOT BEEN DETERMINED. THEY ARE THEREFORE INDICATIVE ONLY AND SHOULD BE VERIFIED BY TEST OR OBSERVATION

Depth (m)	Blows/ 100mm	Inferred Consistency	Shear Strength	CBR %
0				
0.1	4	Soft	35 kPa	7
0.2	6	Firm	50 kPa	10
0.3	17	Stiff	140 kPa	31
0.4	13	Stiff	110 kPa	23
0.5	8	Firm	65 kPa	14
0.6	7	Firm	60 kPa	12
0.7	6	Firm	50 kPa	10
0.8	7	Firm	60 kPa	12
0.9	4	Soft	35 kPa	7
1	6	Firm	50 kPa	10
1.1	7	Firm	60 kPa	12
1.2	5	Firm	40 kPa	8
1.3	7	Firm	60 kPa	12
1.4	6	Firm	50 kPa	10
1.5	6	Firm	50 kPa	10
1.6	6	Firm	50 kPa	10
1.7	5	Firm	40 kPa	8
1.8	7	Firm	60 kPa	12
1.9	6	Firm	50 kPa	10
2	7	Firm	60 kPa	12
2.1	7	Firm	60 kPa	12
2.2	11	Stiff	90 kPa	19
2.3	9	Stiff	75 kPa	15
2.4	10	Stiff	85 kPa	17
2.5	9	Stiff	75 kPa	15
2.6	13	Stiff	110 kPa	23
	Refusal			



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Client: Escongweni BPH Engineers (Pty) Ltd **Ref.No.** 085-20

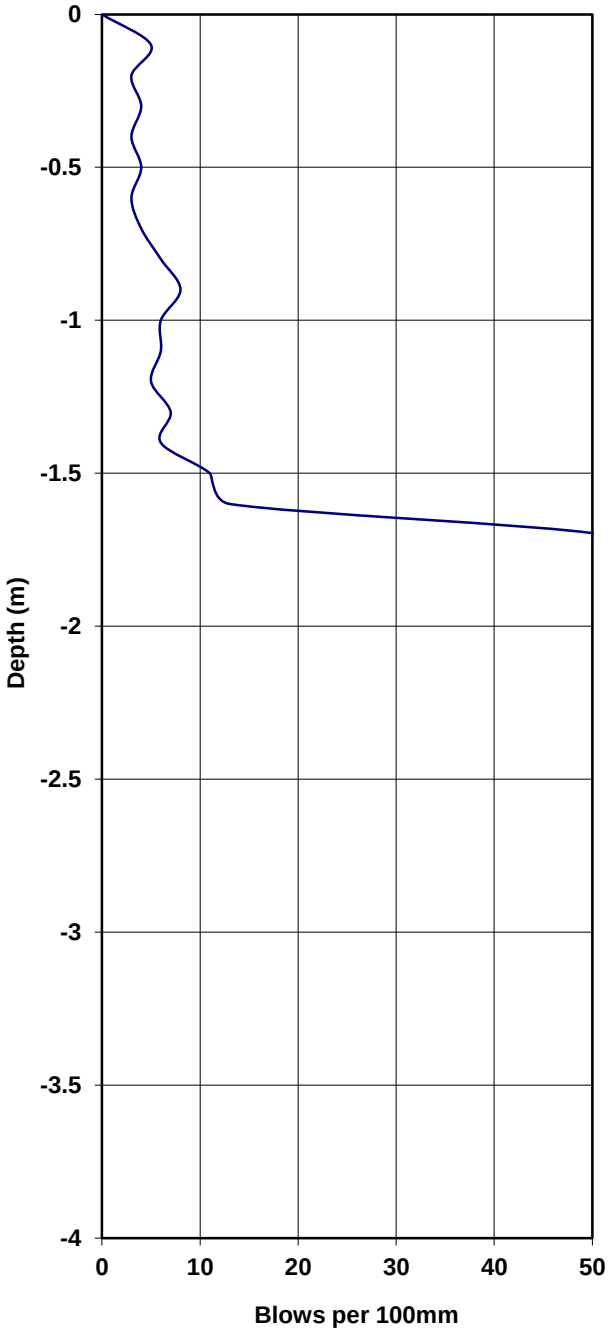
Project: Proposed Water Supply Scheme at Mpolweni **Date:** 15.05.2020

Section: Umgungundlovu District Municipality **Operator:** E.Dada-Mia

CBR Penetrometer Probe ---------- Test No. DC 11

THE STRENGTH AND CBR VALUES ARE EMPIRICAL AND DEPEND ON FACTORS SUCH AS MOISTURE CONTENT WHICH HAVE NOT BEEN DETERMINED. THEY ARE THEREFORE INDICATIVE ONLY AND SHOULD BE VERIFIED BY TEST OR OBSERVATION

Depth (m)	Blows/ 100mm	Inferred Consistency	Shear Strength	CBR %
0				
0.1	5	Med.Dense	32 deg	8
0.2	3	Loose	<30 deg	5
0.3	4	Med.Dense	30 deg	7
0.4	3	Loose	<30 deg	5
0.5	4	Med.Dense	30 deg	7
0.6	3	Loose	<30 deg	5
0.7	4	Med.Dense	30 deg	7
0.8	6	Firm	50 kPa	10
0.9	8	Firm	65 kPa	14
1	6	Firm	50 kPa	10
1.1	6	Firm	50 kPa	10
1.2	5	Firm	40 kPa	8
1.3	7	Firm	60 kPa	12
1.4	6	Firm	50 kPa	10
1.5	11	Stiff	90 kPa	19
1.6	13	Stiff	110 kPa	23
	Refusal			



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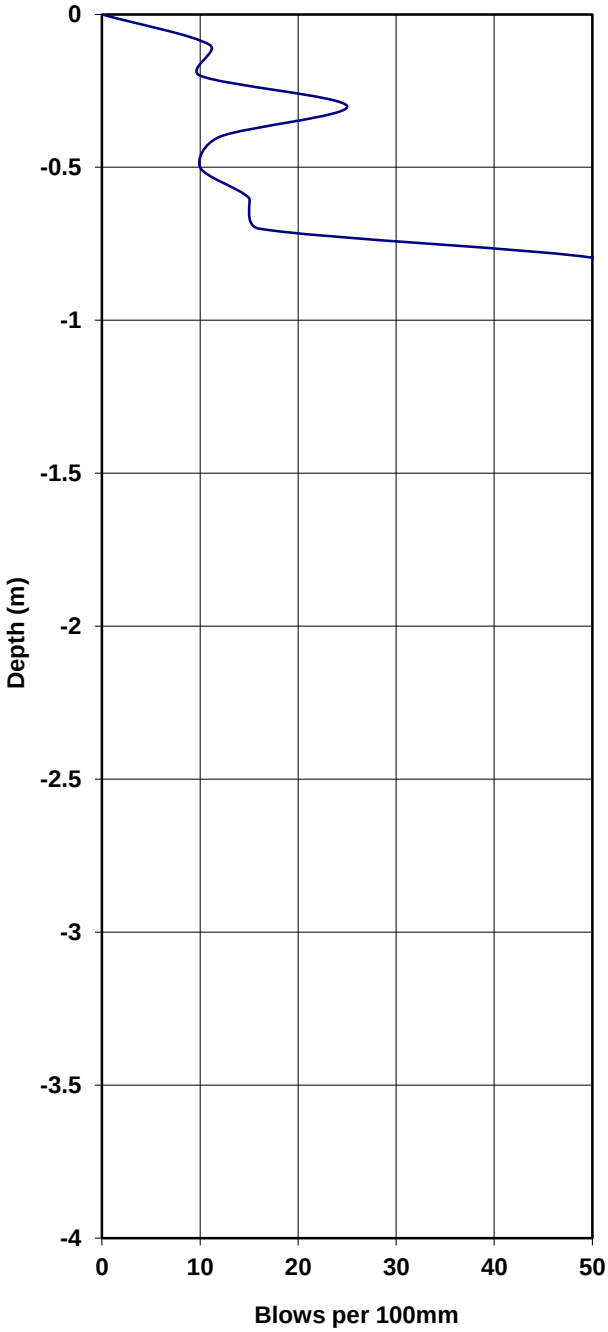
Project: Proposed Water Supply Scheme at Mpolweni **Date:** 15.05.2020

Section: Umgungundlovu District Municipality **Operator:** E.Dada-Mia

CBR Penetrometer Probe ---------- Test No. DC 12

THE STRENGTH AND CBR VALUES ARE EMPIRICAL AND DEPEND ON FACTORS SUCH AS MOISTURE CONTENT WHICH HAVE NOT BEEN DETERMINED. THEY ARE THEREFORE INDICATIVE ONLY AND SHOULD BE VERIFIED BY TEST OR OBSERVATION

Depth (m)	Blows/ 100mm	Inferred Consistency	Shear Strength	CBR %
0				
0.1	11	Dense	36 deg	19
0.2	10	Med.Dense	36 deg	17
0.3	25	Very Dense	38 deg	49
0.4	12	Dense	36 deg	21
0.5	10	Med.Dense	36 deg	17
0.6	15	Dense	37 deg	27
0.7	16	Dense	37 deg	29
	Refusal			



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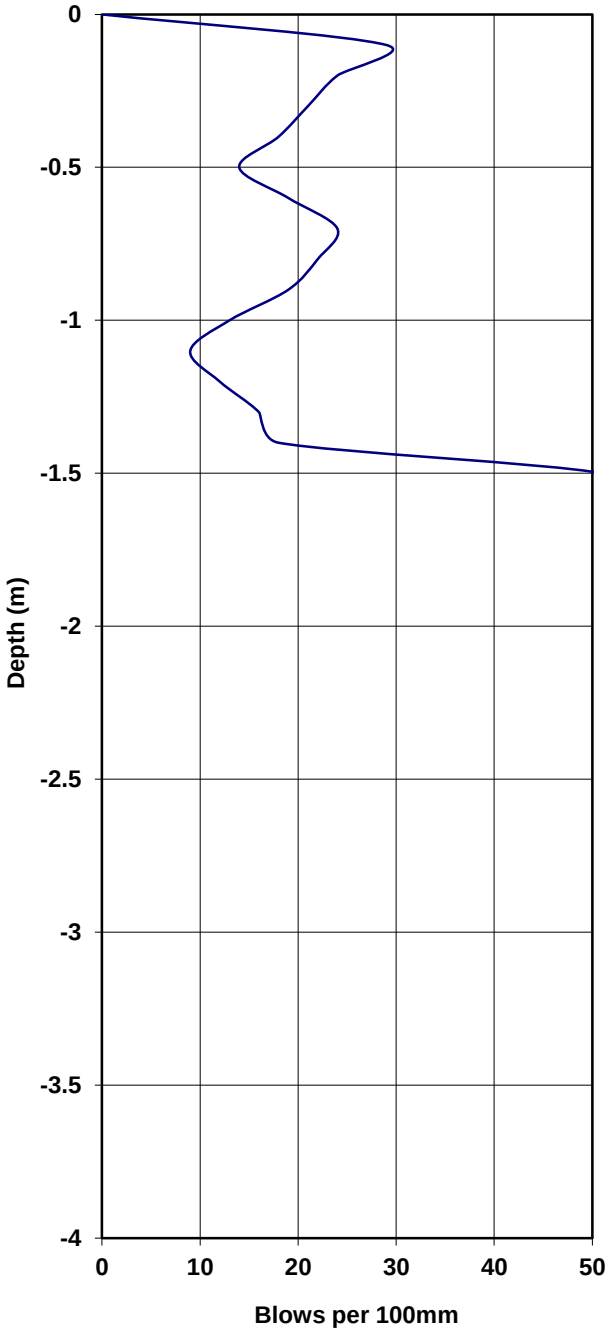
Project: Proposed Water Supply Scheme at Mpolweni **Date:** 15.05.2020

Section: Umgungundlovu District Municipality **Operator:** E.Dada-Mia

CBR Penetrometer Probe ---------- Test No. DC 13

THE STRENGTH AND CBR VALUES ARE EMPIRICAL AND DEPEND ON FACTORS SUCH AS MOISTURE CONTENT WHICH HAVE NOT BEEN DETERMINED. THEY ARE THEREFORE INDICATIVE ONLY AND SHOULD BE VERIFIED BY TEST OR OBSERVATION

Depth (m)	Blows/ 100mm	Inferred Consistency	Shear Strength	CBR %
0				
0.1	29	Very Dense	>38 deg	>55
0.2	24	Dense	38 deg	47
0.3	21	Dense	38 deg	40
0.4	18	Dense	37 deg	33
0.5	14	Dense	37 deg	25
0.6	19	Dense	37 deg	35
0.7	24	Dense	38 deg	47
0.8	22	Dense	38 deg	42
0.9	19	Dense	37 deg	35
1	13	Dense	37 deg	23
1.1	9	Med.Dense	35 deg	15
1.2	12	Dense	36 deg	21
1.3	16	Dense	37 deg	29
1.4	18	Dense	37 deg	33
	Refusal			



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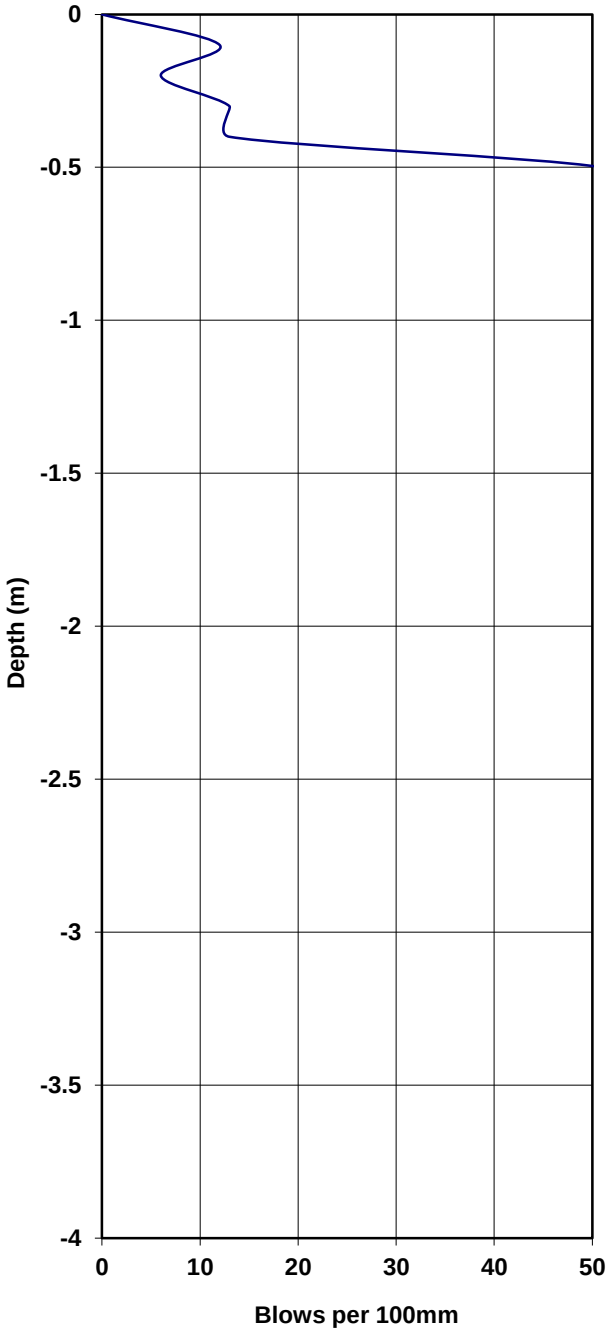
CBR Penetrometer Probe ---------- Test No. DC 14

THE STRENGTH AND CBR VALUES ARE EMPIRICAL AND DEPEND ON FACTORS SUCH AS MOISTURE CONTENT WHICH HAVE NOT BEEN DETERMINED. THEY ARE THEREFORE INDICATIVE ONLY AND SHOULD BE VERIFIED BY TEST OR OBSERVATION

Depth (m)	Blows/ 100mm	Inferred Consistency	Shear Strength	CBR %
0				
0.1	12	Stiff	100 kPa	21
0.2	6	Firm	50 kPa	10
0.3	13	Stiff	110 kPa	23
0.4	13	Stiff	110 kPa	23
	Refusal			



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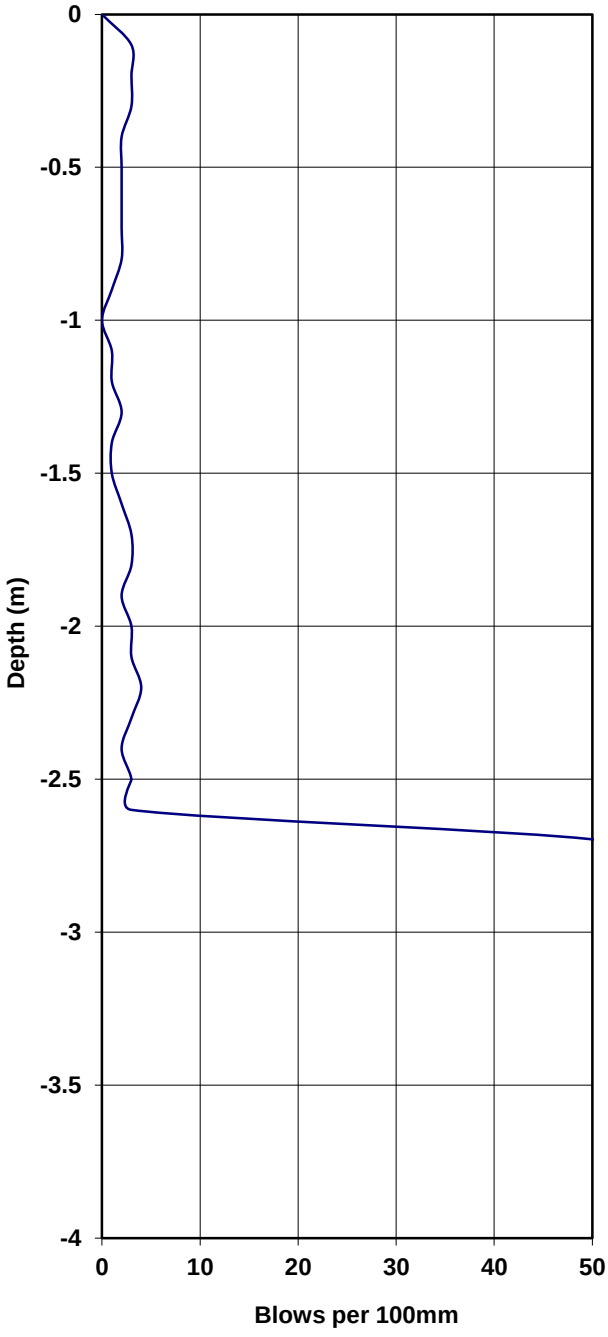
CBR Penetrometer Probe ---------- Test No. DC 15

THE STRENGTH AND CBR VALUES ARE EMPIRICAL AND DEPEND ON FACTORS SUCH AS MOISTURE CONTENT WHICH HAVE NOT BEEN DETERMINED. THEY ARE THEREFORE INDICATIVE ONLY AND SHOULD BE VERIFIED BY TEST OR OBSERVATION

Depth (m)	Blows/ 100mm	Inferred Consistency	Shear Strength	CBR %
0				
0.1	3	Loose	<30 deg	5
0.2	3	Loose	<30 deg	5
0.3	3	Loose	<30 deg	5
0.4	2	Loose	<30 deg	3
0.5	2	Loose	<30 deg	3
0.6	2	Loose	<30 deg	3
0.7	2	Loose	<30 deg	3
0.8	2	Loose	<30 deg	3
0.9	1	Very Loose	<29 deg	2
1	0	V.V.Loose	<28 deg	<2
1.1	1	Very Loose	<29 deg	2
1.2	1	Very Loose	<29 deg	2
1.3	2	Loose	<30 deg	3
1.4	1	Very Loose	<29 deg	2
1.5	1	Very Loose	<29 deg	2
1.6	2	Loose	<30 deg	3
1.7	3	Loose	<30 deg	5
1.8	3	Loose	<30 deg	5
1.9	2	Loose	<30 deg	3
2	3	Loose	<30 deg	5
2.1	3	Loose	<30 deg	5
2.2	4	Med.Dense	30 deg	7
2.3	3	Loose	<30 deg	5
2.4	2	Loose	<30 deg	3
2.5	3	Loose	<30 deg	5
2.6	3	Loose	<30 deg	5
	Refusal			



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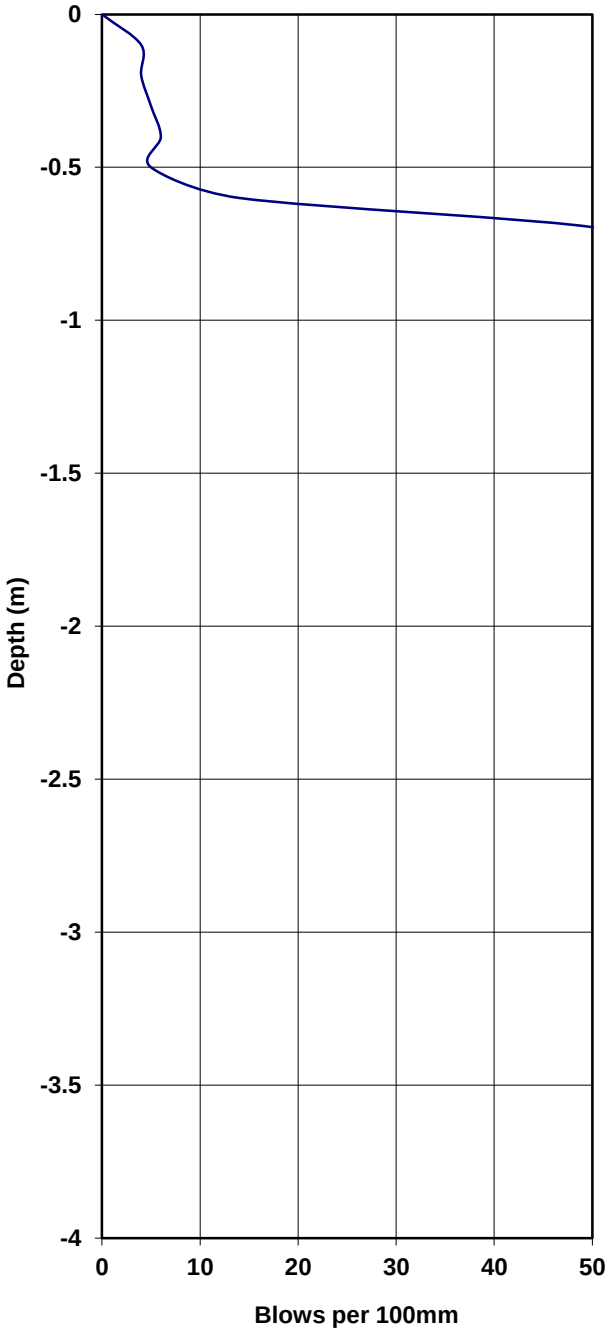
CBR Penetrometer Probe ---------- Test No. DC 16

THE STRENGTH AND CBR VALUES ARE EMPIRICAL AND DEPEND ON FACTORS SUCH AS MOISTURE CONTENT WHICH HAVE NOT BEEN DETERMINED. THEY ARE THEREFORE INDICATIVE ONLY AND SHOULD BE VERIFIED BY TEST OR OBSERVATION

Depth (m)	Blows/ 100mm	Inferred Consistency	Shear Strength	CBR %
0				
0.1	4	Med.Dense	30 deg	7
0.2	4	Med.Dense	30 deg	7
0.3	5	Med.Dense	32 deg	8
0.4	6	Firm	50 kPa	10
0.5	5	Firm	40 kPa	8
0.6	14	Stiff	115 kPa	25
	Refusal			



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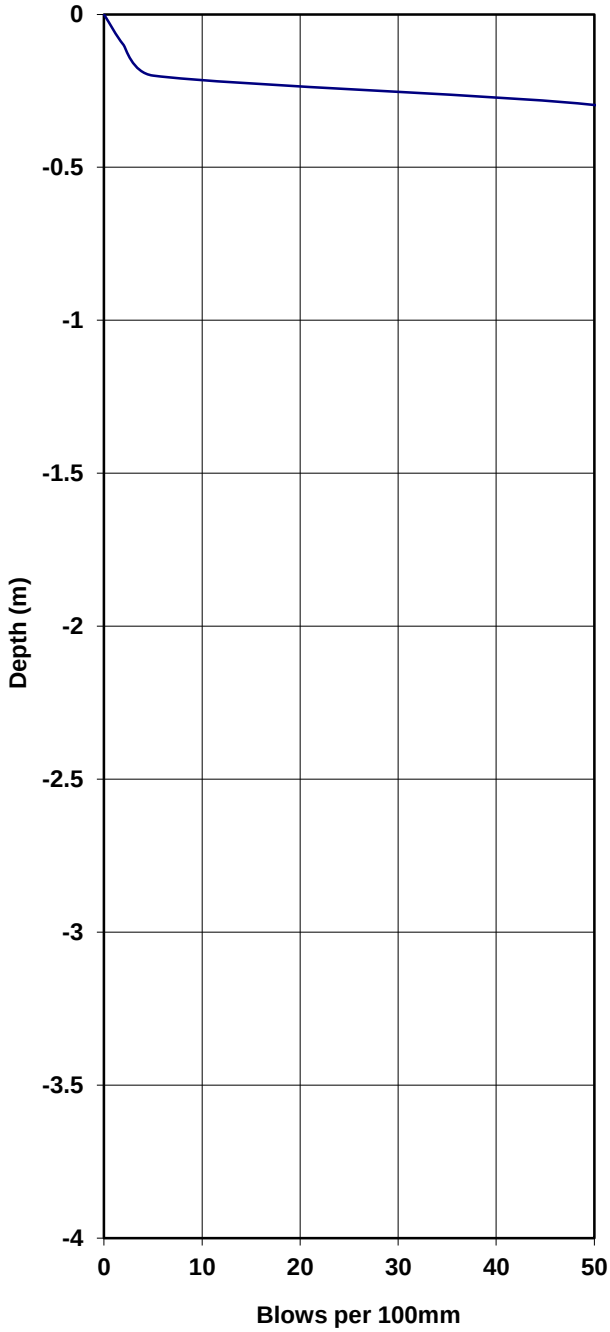
CBR Penetrometer Probe ---------- Test No. DC 17

THE STRENGTH AND CBR VALUES ARE EMPIRICAL AND DEPEND ON FACTORS SUCH AS MOISTURE CONTENT WHICH HAVE NOT BEEN DETERMINED. THEY ARE THEREFORE INDICATIVE ONLY AND SHOULD BE VERIFIED BY TEST OR OBSERVATION

Depth (m)	Blows/ 100mm	Inferred Consistency	Shear Strength	CBR %
0				
0.1	2	Loose	<30 deg	3
0.2	5	Med.Dense	32 deg	8
	Refusal			



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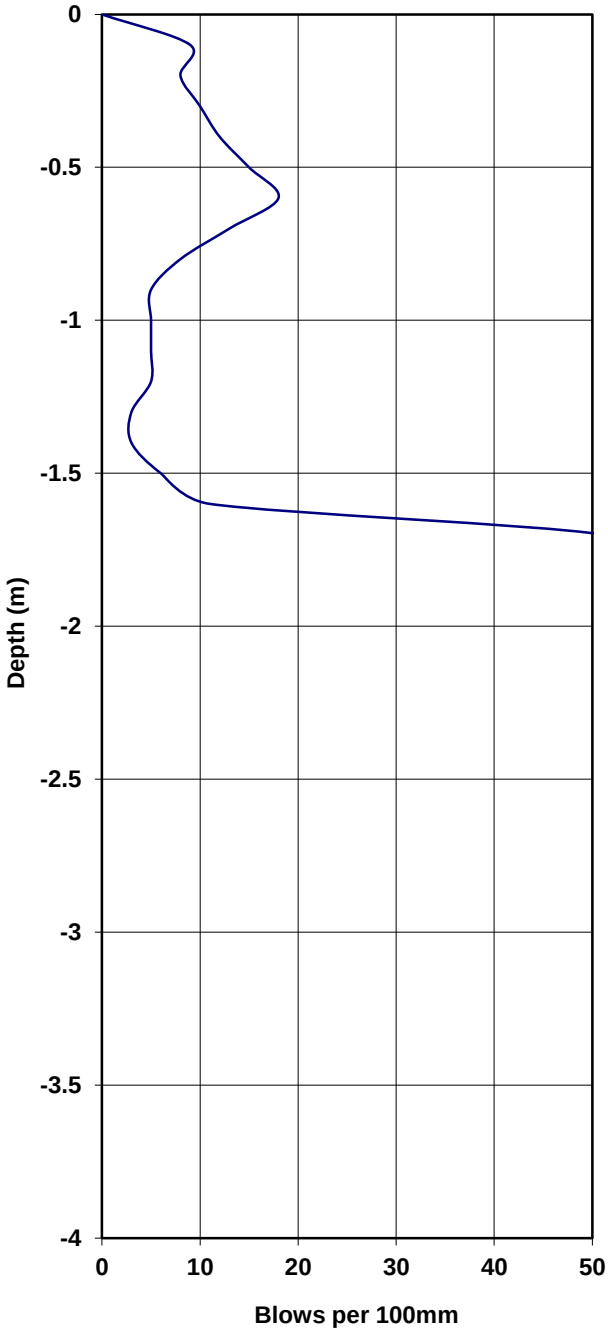
Section: Umgungundlovu District Municipality **Operator:** E.Dada-Mia

CBR Penetrometer Probe ---------- Test No. DC 18

THE STRENGTH AND CBR VALUES ARE EMPIRICAL AND DEPEND ON FACTORS SUCH AS MOISTURE CONTENT WHICH HAVE NOT BEEN DETERMINED. THEY ARE THEREFORE INDICATIVE ONLY AND SHOULD BE VERIFIED BY TEST OR OBSERVATION

Depth (m)	Blows/ 100mm	Inferred Consistency	Shear Strength	CBR %
0				
0.1	9	Med.Dense	35 deg	15
0.2	8	Med.Dense	35 deg	14
0.3	10	Med.Dense	36 deg	17
0.4	12	Dense	36 deg	21
0.5	15	Dense	37 deg	27
0.6	18	Dense	37 deg	33
0.7	13	Stiff	110 kPa	23
0.8	8	Firm	65 kPa	14
0.9	5	Firm	40 kPa	8
1	5	Firm	40 kPa	8
1.1	5	Firm	40 kPa	8
1.2	5	Firm	40 kPa	8
1.3	3	Soft	25 kPa	5
1.4	3	Soft	25 kPa	5
1.5	6	Firm	50 kPa	10
1.6	11	Dense	36 deg	19
	Refusal			



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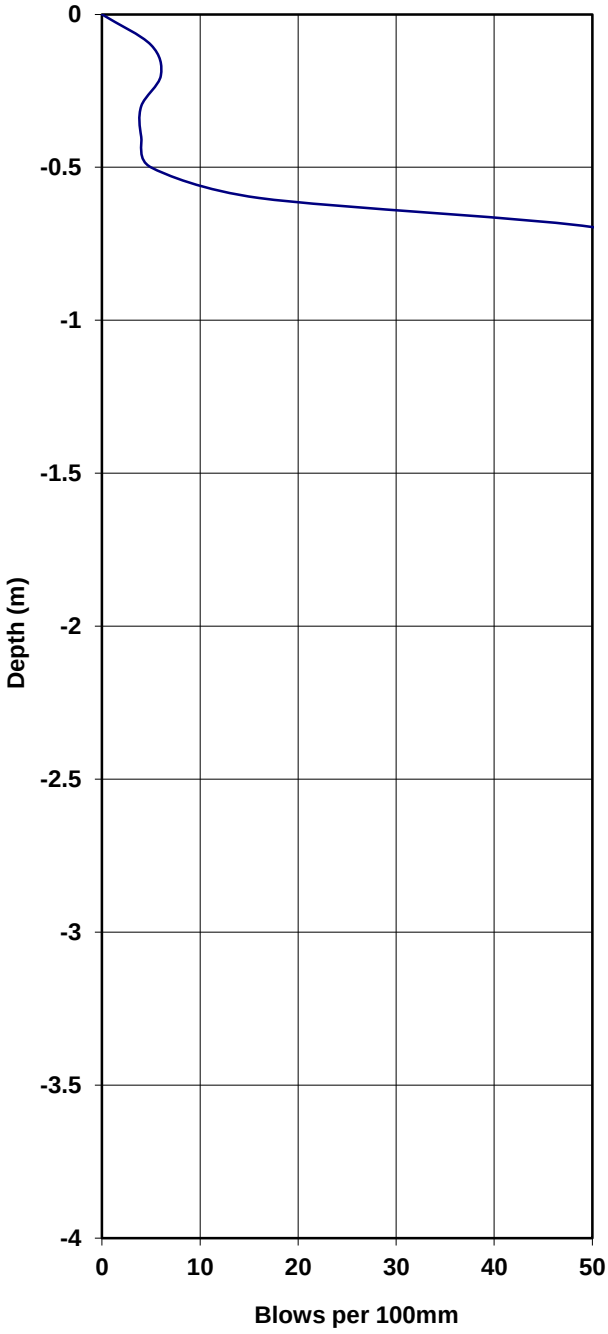
CBR Penetrometer Probe ---------- Test No. DC 19

THE STRENGTH AND CBR VALUES ARE EMPIRICAL AND DEPEND ON FACTORS SUCH AS MOISTURE CONTENT WHICH HAVE NOT BEEN DETERMINED. THEY ARE THEREFORE INDICATIVE ONLY AND SHOULD BE VERIFIED BY TEST OR OBSERVATION

Depth (m)	Blows/ 100mm	Inferred Consistency	Shear Strength	CBR %
0				
0.1	5	Med.Dense	32 deg	8
0.2	6	Med.Dense	33 deg	10
0.3	4	Med.Dense	30 deg	7
0.4	4	Med.Dense	30 deg	7
0.5	5	Med.Dense	32 deg	8
0.6	16	Dense	37 deg	29
	Refusal			



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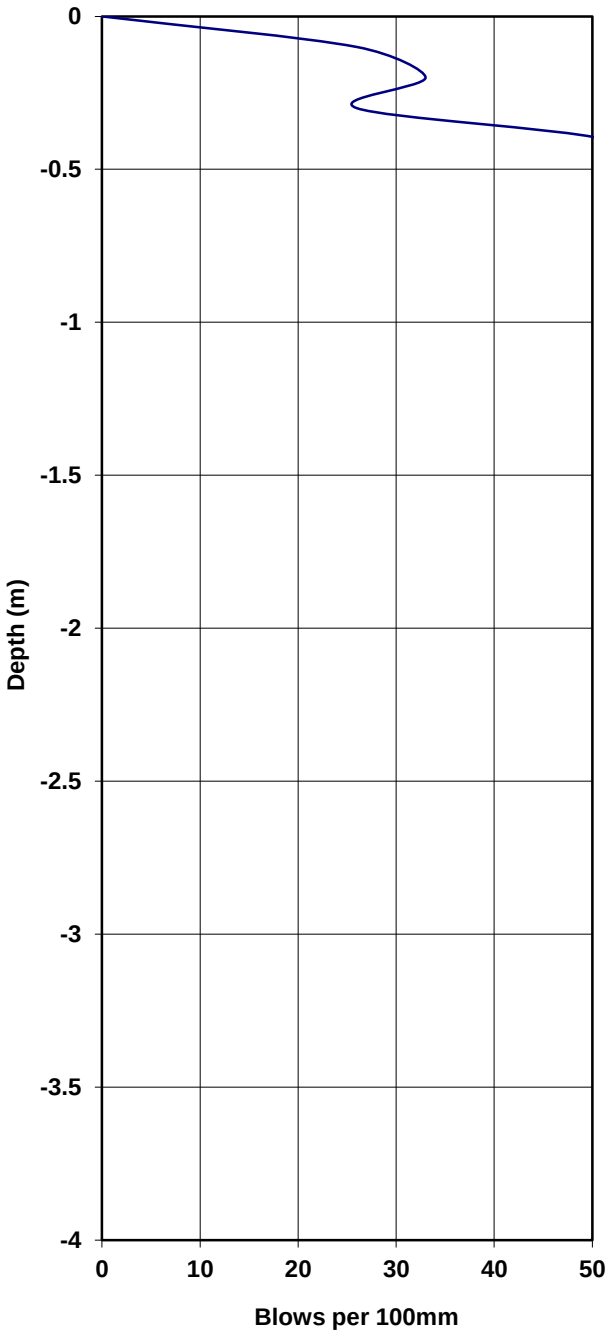
CBR Penetrometer Probe ---------- Test No. DC 20

THE STRENGTH AND CBR VALUES ARE EMPIRICAL AND DEPEND ON FACTORS SUCH AS MOISTURE CONTENT WHICH HAVE NOT BEEN DETERMINED. THEY ARE THEREFORE INDICATIVE ONLY AND SHOULD BE VERIFIED BY TEST OR OBSERVATION

Depth (m)	Blows/ 100mm	Inferred Consistency	Shear Strength	CBR %
0				
0.1	26	Very Dense	>38 deg	51
0.2	33	Very Dense	>38 deg	>55
0.3	26	Very Dense	>38 deg	51
	Refusal			



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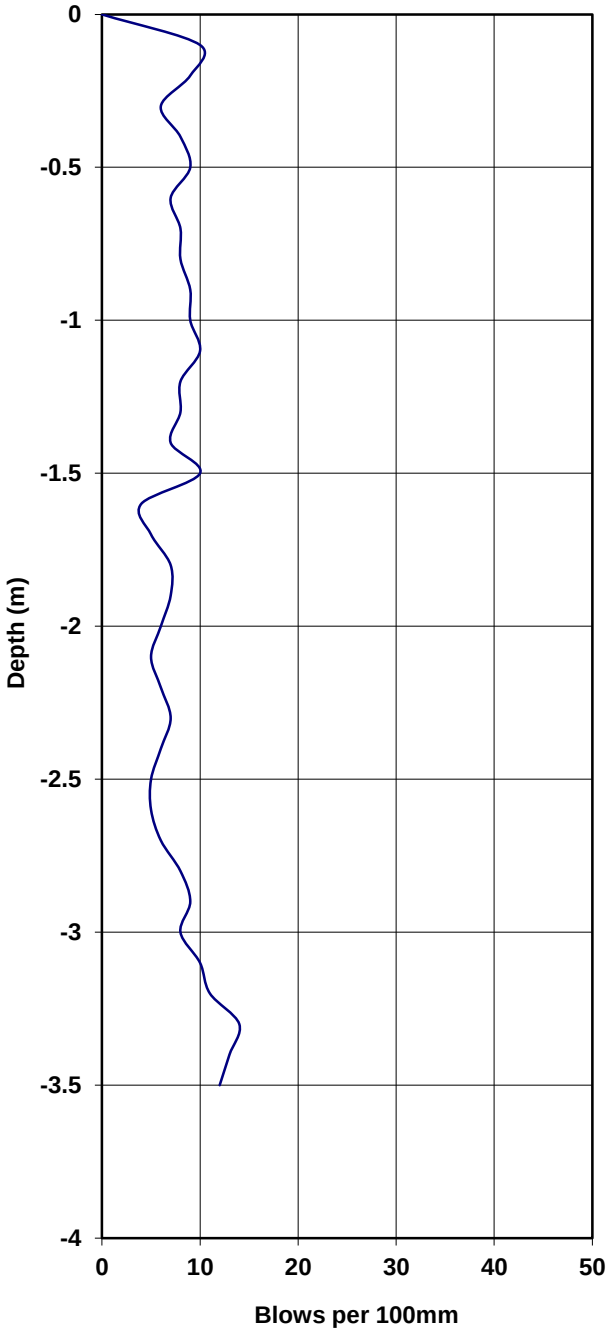
CBR Penetrometer Probe ---------- Test No. DC 21

THE STRENGTH AND CBR VALUES ARE EMPIRICAL AND DEPEND ON FACTORS SUCH AS MOISTURE CONTENT WHICH HAVE NOT BEEN DETERMINED. THEY ARE THEREFORE INDICATIVE ONLY AND SHOULD BE VERIFIED BY TEST OR OBSERVATION

Depth (m)	Blows/ 100mm	Inferred Consistency	Shear Strength	CBR %
0				
0.1	10	Med.Dense	36 deg	17
0.2	9	Med.Dense	35 deg	15
0.3	6	Med.Dense	33 deg	10
0.4	8	Med.Dense	35 deg	14
0.5	9	Med.Dense	35 deg	15
0.6	7	Firm	60 kPa	12
0.7	8	Firm	65 kPa	14
0.8	8	Firm	65 kPa	14
0.9	9	Stiff	75 kPa	15
1	9	Stiff	75 kPa	15
1.1	10	Stiff	85 kPa	17
1.2	8	Firm	65 kPa	14
1.3	8	Firm	65 kPa	14
1.4	7	Firm	60 kPa	12
1.5	10	Stiff	85 kPa	17
1.6	4	Soft	35 kPa	7
1.7	5	Firm	40 kPa	8
1.8	7	Firm	60 kPa	12
1.9	7	Firm	60 kPa	12
2	6	Firm	50 kPa	10
2.1	5	Firm	40 kPa	8
2.2	6	Firm	50 kPa	10
2.3	7	Firm	60 kPa	12
2.4	6	Firm	50 kPa	10
2.5	5	Firm	40 kPa	8
2.6	5	Firm	40 kPa	8
2.7	6	Firm	50 kPa	10
2.8	8	Firm	65 kPa	14
2.9	9	Stiff	75 kPa	15
3	8	Firm	65 kPa	14
3.1	10	Stiff	85 kPa	17
3.2	11	Stiff	90 kPa	19
3.3	14	Stiff	115 kPa	25
3.4	13	Stiff	110 kPa	23
3.5	12	Stiff	100 kPa	21
	End			



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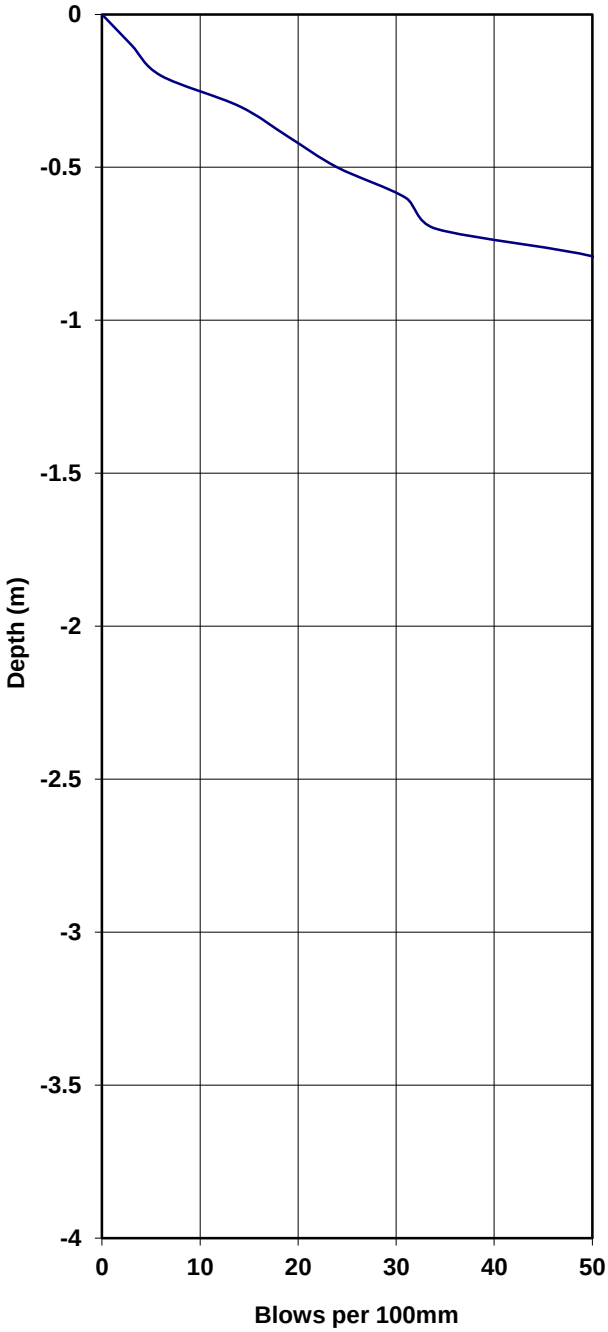
CBR Penetrometer Probe ---------- Test No. DC 22

THE STRENGTH AND CBR VALUES ARE EMPIRICAL AND DEPEND ON FACTORS SUCH AS MOISTURE CONTENT WHICH HAVE NOT BEEN DETERMINED. THEY ARE THEREFORE INDICATIVE ONLY AND SHOULD BE VERIFIED BY TEST OR OBSERVATION

Depth (m)	Blows/ 100mm	Inferred Consistency	Shear Strength	CBR %
0				
0.1	3	Loose	<30 deg	5
0.2	6	Med.Dense	33 deg	10
0.3	14	Stiff	115 kPa	25
0.4	19	Very Stiff	>150 kPa	35
0.5	24	Very Stiff	>150 kPa	47
0.6	31	Very Stiff	>150 kPa	>55
0.7	34	Very Stiff	>150 kPa	>55
	Refusal			



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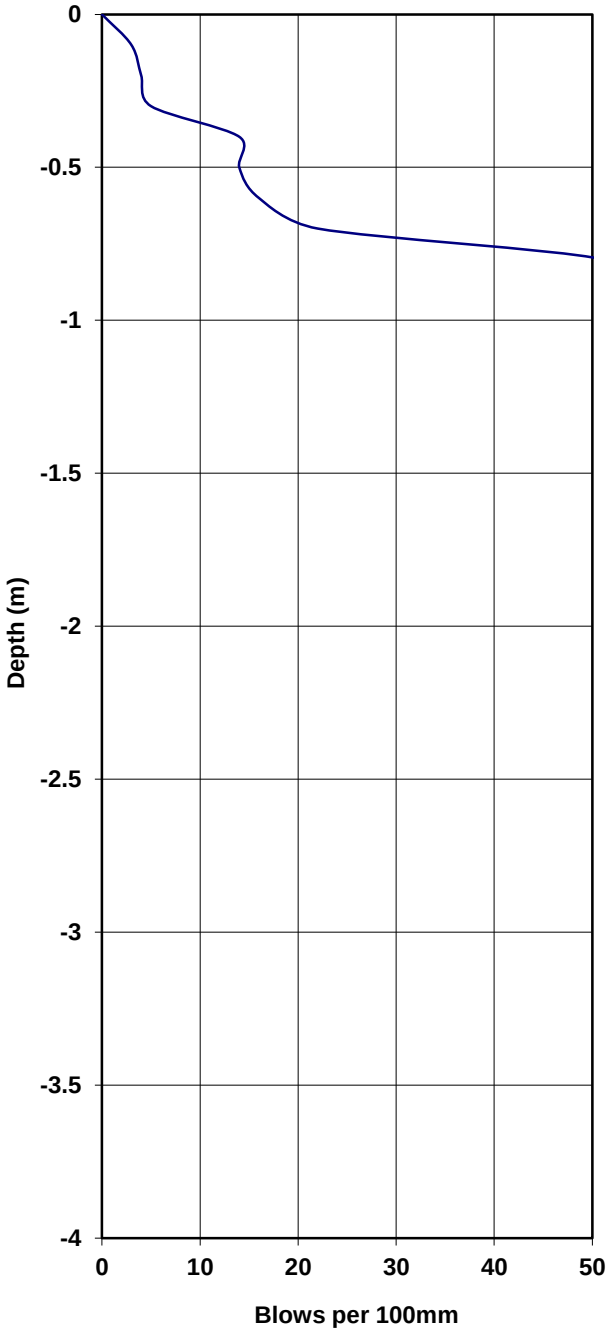
Section: Umgungundlovu District Municipality **Operator:** E.Dada-Mia

CBR Penetrometer Probe ---------- Test No. DC 23

THE STRENGTH AND CBR VALUES ARE EMPIRICAL AND DEPEND ON FACTORS SUCH AS MOISTURE CONTENT WHICH HAVE NOT BEEN DETERMINED. THEY ARE THEREFORE INDICATIVE ONLY AND SHOULD BE VERIFIED BY TEST OR OBSERVATION

Depth (m)	Blows/ 100mm	Inferred Consistency	Shear Strength	CBR %
0				
0.1	3	Loose	<30 deg	5
0.2	4	Med.Dense	30 deg	7
0.3	5	Med.Dense	32 deg	8
0.4	14	Stiff	115 kPa	25
0.5	14	Stiff	115 kPa	25
0.6	16	Stiff	130 kPa	29
0.7	22	Very Stiff	>150 kPa	42
	Refusal			
	.			



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GEOSURE (Pty) Ltd

Client: Escongweni BPH Engineers (Pty) Ltd **Ref.No.** 085-20

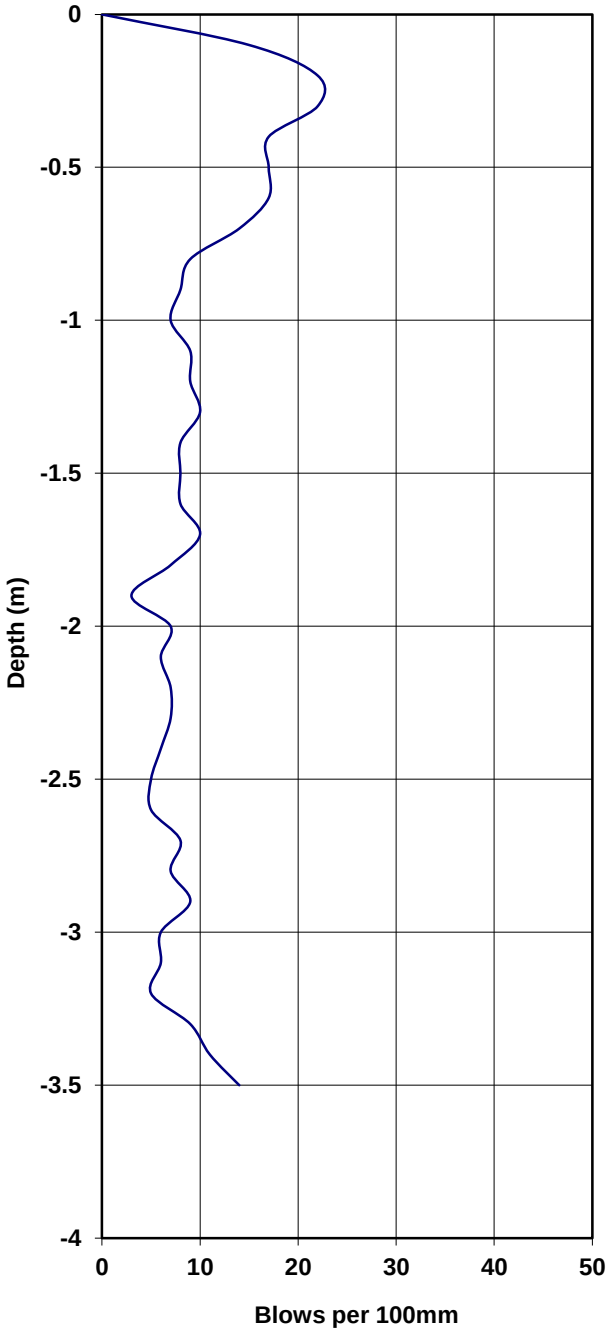
Project: Proposed Water Supply Scheme at Mpolweni **Date:** 15.05.2020

Section: Umgungundlovu District Municipality **Operator:** E.Dada-Mia

CBR Penetrometer Probe ---------- Test No. DC 24

THE STRENGTH AND CBR VALUES ARE EMPIRICAL AND DEPEND ON FACTORS SUCH AS MOISTURE CONTENT WHICH HAVE NOT BEEN DETERMINED. THEY ARE THEREFORE INDICATIVE ONLY AND SHOULD BE VERIFIED BY TEST OR OBSERVATION

Depth (m)	Blows/ 100mm	Inferred Consistency	Shear Strength	CBR %
0				
0.1	15	Stiff	125 kPa	27
0.2	22	Very Stiff	>150 kPa	42
0.3	22	Very Stiff	>150 kPa	42
0.4	17	Stiff	140 kPa	31
0.5	17	Stiff	140 kPa	31
0.6	17	Stiff	140 kPa	31
0.7	14	Stiff	115 kPa	25
0.8	9	Stiff	75 kPa	15
0.9	8	Firm	65 kPa	14
1	7	Firm	60 kPa	12
1.1	9	Stiff	75 kPa	15
1.2	9	Stiff	75 kPa	15
1.3	10	Stiff	85 kPa	17
1.4	8	Firm	65 kPa	14
1.5	8	Firm	65 kPa	14
1.6	8	Firm	65 kPa	14
1.7	10	Stiff	85 kPa	17
1.8	7	Firm	60 kPa	12
1.9	3	Soft	25 kPa	5
2	7	Firm	60 kPa	12
2.1	6	Firm	50 kPa	10
2.2	7	Firm	60 kPa	12
2.3	7	Firm	60 kPa	12
2.4	6	Firm	50 kPa	10
2.5	5	Firm	40 kPa	8
2.6	5	Firm	40 kPa	8
2.7	8	Firm	65 kPa	14
2.8	7	Firm	60 kPa	12
2.9	9	Stiff	75 kPa	15
3	6	Firm	50 kPa	10
3.1	6	Firm	50 kPa	10
3.2	5	Firm	40 kPa	8
3.3	9	Stiff	75 kPa	15
3.4	11	Stiff	90 kPa	19
3.5	14	Stiff	115 kPa	25
	End			



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GEOSURE (Pty) Ltd

Client: Escongweni BPH Engineers (Pty) Ltd **Ref.No.** 085-20

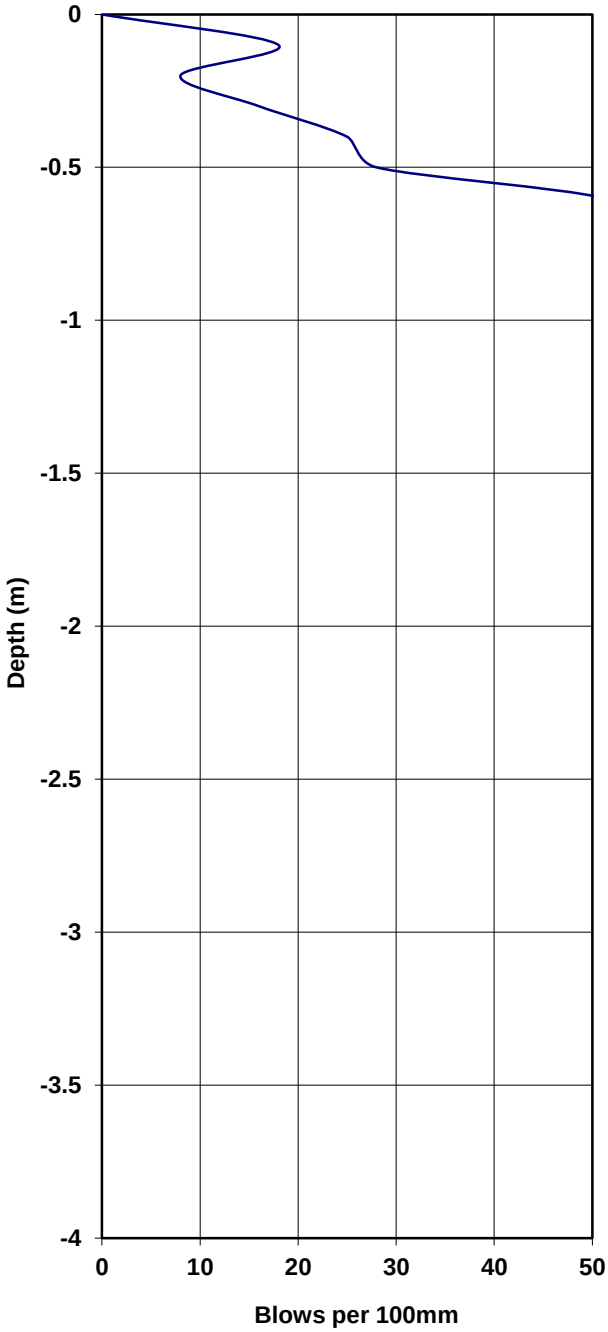
Project: Proposed Water Supply Scheme at Mpolweni **Date:** 15.05.2020

Section: Umgungundlovu District Municipality **Operator:** E.Dada-Mia

CBR Penetrometer Probe ---------- Test No. DC 25

THE STRENGTH AND CBR VALUES ARE EMPIRICAL AND DEPEND ON FACTORS SUCH AS MOISTURE CONTENT WHICH HAVE NOT BEEN DETERMINED. THEY ARE THEREFORE INDICATIVE ONLY AND SHOULD BE VERIFIED BY TEST OR OBSERVATION

Depth (m)	Blows/ 100mm	Inferred Consistency	Shear Strength	CBR %
0				
0.1	18	Dense	37 deg	33
0.2	8	Med.Dense	35 deg	14
0.3	16	Dense	37 deg	29
0.4	25	Dense	38 deg	49
0.5	28	Very Dense	>38 deg	>55
	Refusal			



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GEOSURE (Pty) Ltd

Client: Escongweni BPH Engineers (Pty) Ltd **Ref.No.** 085-20

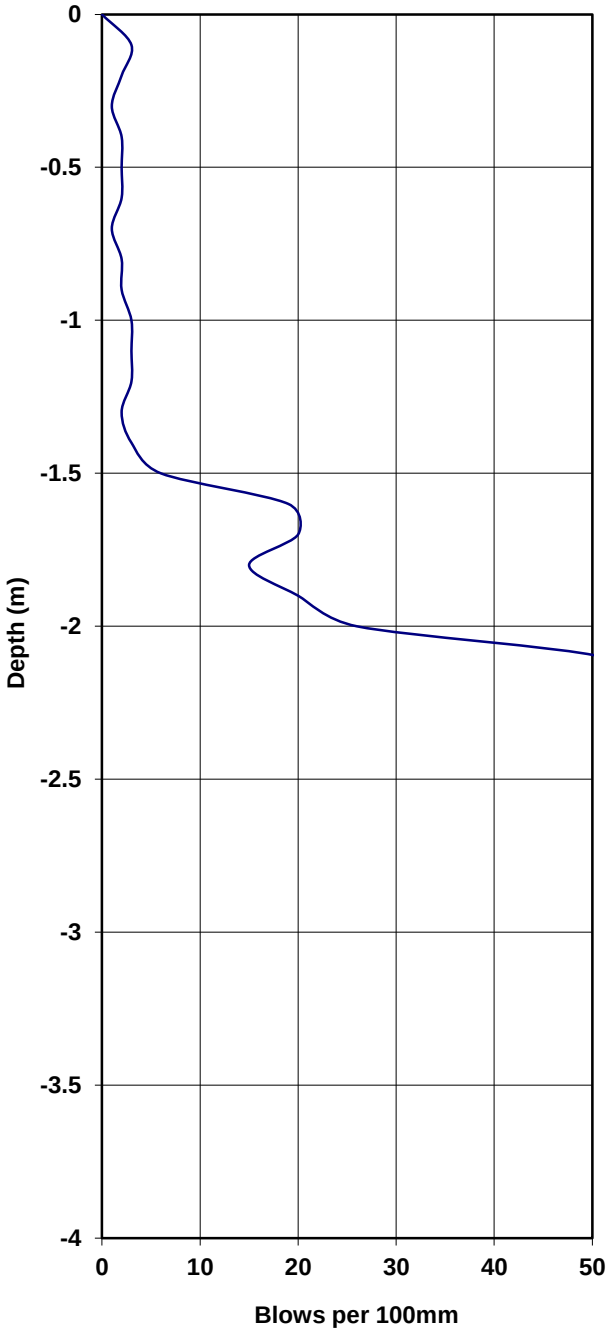
Project: Proposed Water Supply Scheme at Mpolweni **Date:** 15.05.2020

Section: Umgungundlovu District Municipality **Operator:** E.Dada-Mia

CBR Penetrometer Probe ---------- Test No. DC 26

THE STRENGTH AND CBR VALUES ARE EMPIRICAL AND DEPEND ON FACTORS SUCH AS MOISTURE CONTENT WHICH HAVE NOT BEEN DETERMINED. THEY ARE THEREFORE INDICATIVE ONLY AND SHOULD BE VERIFIED BY TEST OR OBSERVATION

Depth (m)	Blows/ 100mm	Inferred Consistency	Shear Strength	CBR %
0				
0.1	3	Soft	25 kPa	5
0.2	2	Soft	20 kPa	3
0.3	1	Very Soft	<20 kPa	2
0.4	2	Soft	20 kPa	3
0.5	2	Soft	20 kPa	3
0.6	2	Soft	20 kPa	3
0.7	1	Very Soft	<20 kPa	2
0.8	2	Soft	20 kPa	3
0.9	2	Soft	20 kPa	3
1	3	Soft	25 kPa	5
1.1	3	Soft	25 kPa	5
1.2	3	Soft	25 kPa	5
1.3	2	Soft	20 kPa	3
1.4	3	Soft	25 kPa	5
1.5	6	Firm	50 kPa	10
1.6	19	Very Stiff	>150 kPa	35
1.7	20	Very Stiff	>150 kPa	37
1.8	15	Stiff	125 kPa	27
1.9	20	Very Stiff	>150 kPa	37
2	26	Very Stiff	>150 kPa	51
	Refusal			



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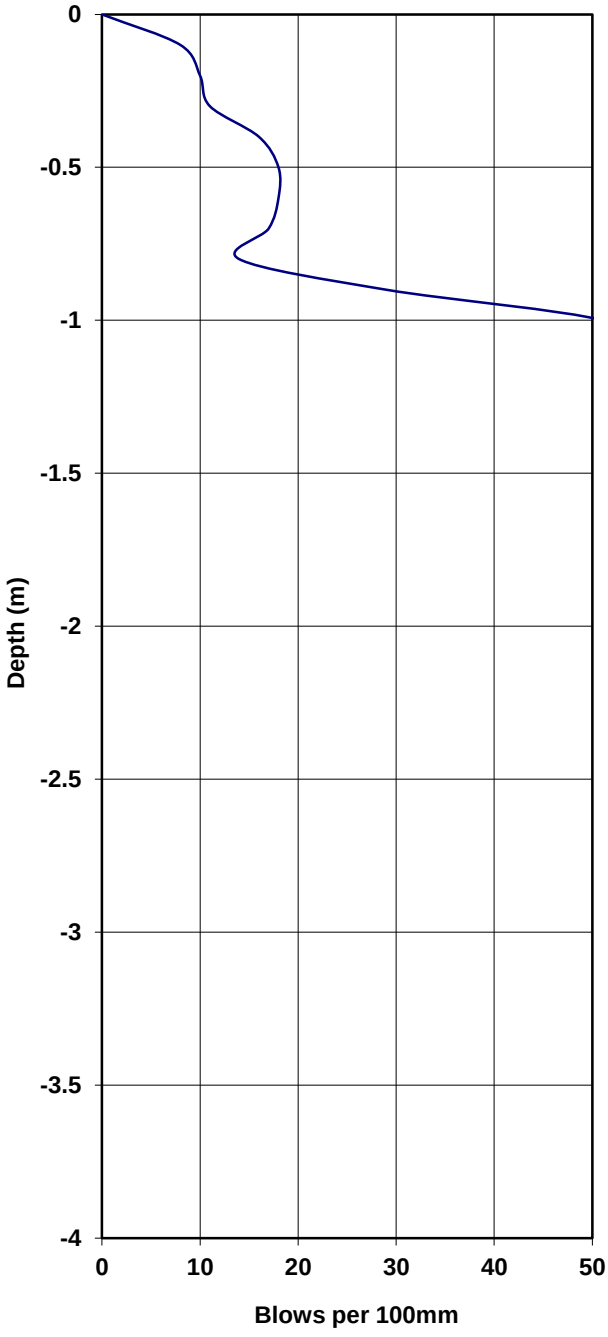
Project: Proposed Water Supply Scheme at Mpolweni **Date:** 15.05.2020

Section: Umgungundlovu District Municipality **Operator:** E.Dada-Mia

CBR Penetrometer Probe ---------- Test No. DC 27

THE STRENGTH AND CBR VALUES ARE EMPIRICAL AND DEPEND ON FACTORS SUCH AS MOISTURE CONTENT WHICH HAVE NOT BEEN DETERMINED. THEY ARE THEREFORE INDICATIVE ONLY AND SHOULD BE VERIFIED BY TEST OR OBSERVATION

Depth (m)	Blows/ 100mm	Inferred Consistency	Shear Strength	CBR %
0				
0.1	8	Med.Dense	35 deg	14
0.2	10	Med.Dense	36 deg	17
0.3	11	Dense	36 deg	19
0.4	16	Dense	37 deg	29
0.5	18	Dense	37 deg	33
0.6	18	Dense	37 deg	33
0.7	17	Dense	37 deg	31
0.8	14	Dense	37 deg	25
0.9	29	Very Dense	>38 deg	>55
	Refusal			



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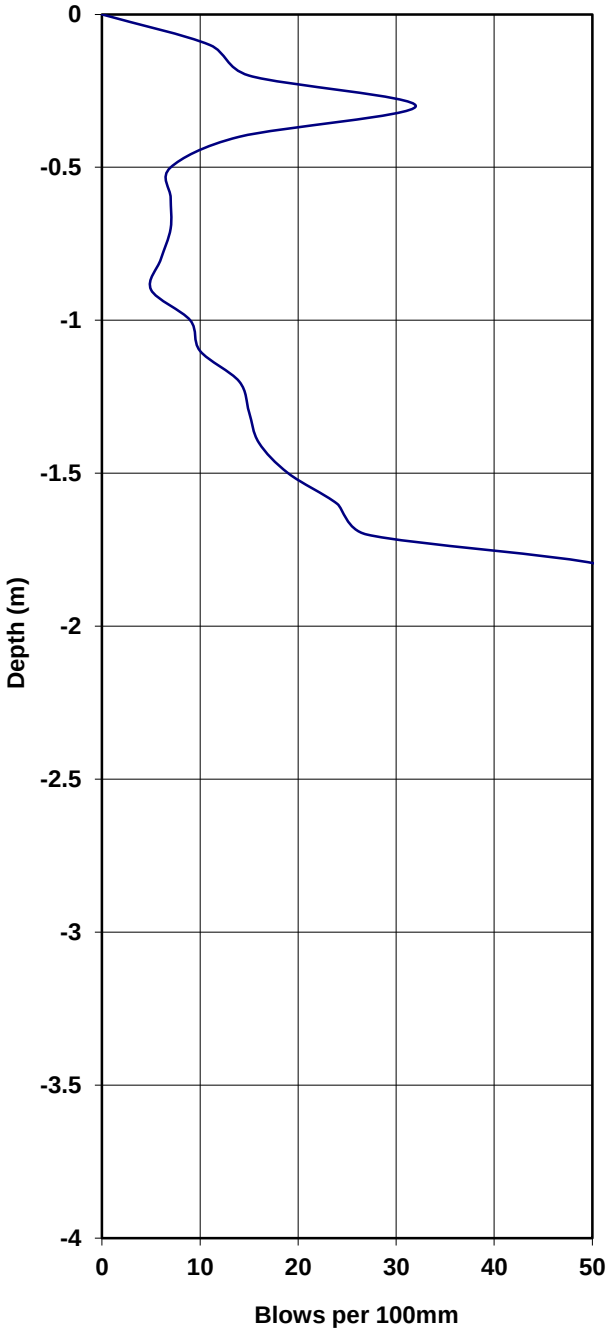
Project: Proposed Water Supply Scheme at Mpolweni **Date:** 15.05.2020

Section: Umgungundlovu District Municipality **Operator:** E.Dada-Mia

CBR Penetrometer Probe ---------- Test No. DC 28

THE STRENGTH AND CBR VALUES ARE EMPIRICAL AND DEPEND ON FACTORS SUCH AS MOISTURE CONTENT WHICH HAVE NOT BEEN DETERMINED. THEY ARE THEREFORE INDICATIVE ONLY AND SHOULD BE VERIFIED BY TEST OR OBSERVATION

Depth (m)	Blows/ 100mm	Inferred Consistency	Shear Strength	CBR %
0				
0.1	11	Dense	36 deg	19
0.2	15	Dense	37 deg	27
0.3	32	Very Stiff	>150 kPa	>55
0.4	14	Stiff	115 kPa	25
0.5	7	Firm	60 kPa	12
0.6	7	Firm	60 kPa	12
0.7	7	Firm	60 kPa	12
0.8	6	Firm	50 kPa	10
0.9	5	Firm	40 kPa	8
1	9	Stiff	75 kPa	15
1.1	10	Stiff	85 kPa	17
1.2	14	Stiff	115 kPa	25
1.3	15	Stiff	125 kPa	27
1.4	16	Stiff	130 kPa	29
1.5	19	Very Stiff	>150 kPa	35
1.6	24	Very Stiff	>150 kPa	47
1.7	27	Very Stiff	>150 kPa	54
	Refusal			



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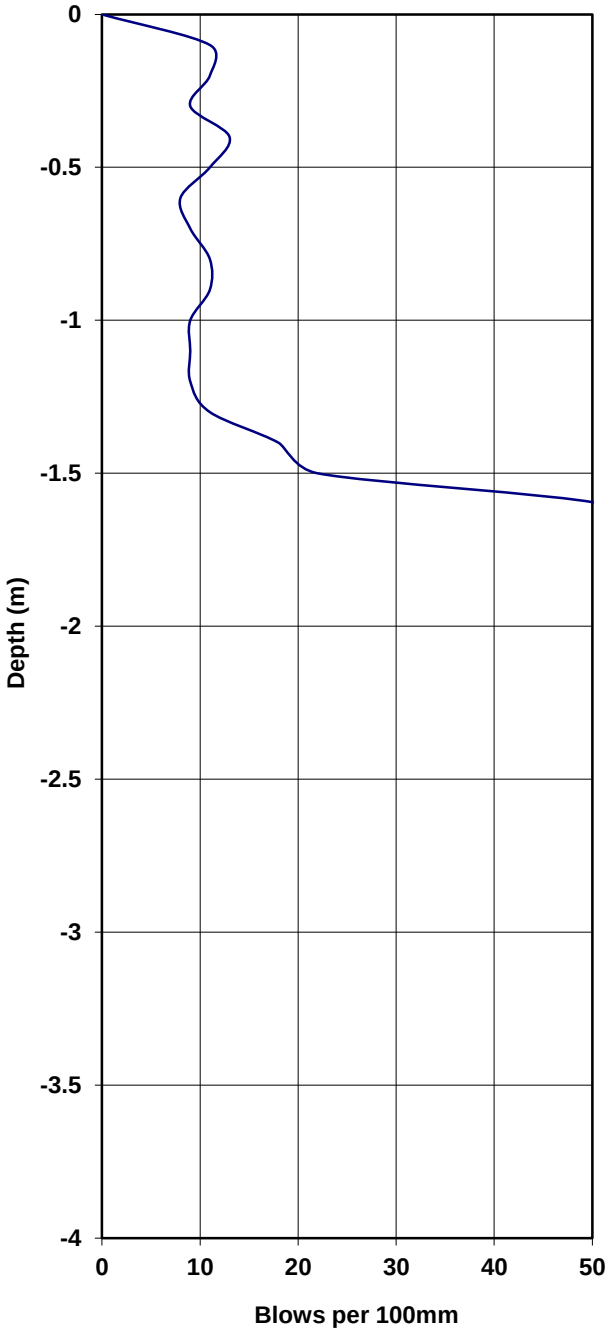
Section: Umgungundlovu District Municipality **Operator:** E.Dada-Mia

CBR Penetrometer Probe ---------- Test No. DC 29

THE STRENGTH AND CBR VALUES ARE EMPIRICAL AND DEPEND ON FACTORS SUCH AS MOISTURE CONTENT WHICH HAVE NOT BEEN DETERMINED. THEY ARE THEREFORE INDICATIVE ONLY AND SHOULD BE VERIFIED BY TEST OR OBSERVATION

Depth (m)	Blows/ 100mm	Inferred Consistency	Shear Strength	CBR %
0				
0.1	11	Stiff	90 kPa	19
0.2	11	Stiff	90 kPa	19
0.3	9	Stiff	75 kPa	15
0.4	13	Stiff	110 kPa	23
0.5	11	Stiff	90 kPa	19
0.6	8	Firm	65 kPa	14
0.7	9	Stiff	75 kPa	15
0.8	11	Stiff	90 kPa	19
0.9	11	Stiff	90 kPa	19
1	9	Med.Dense	35 deg	15
1.1	9	Med.Dense	35 deg	15
1.2	9	Med.Dense	35 deg	15
1.3	11	Dense	36 deg	19
1.4	18	Dense	37 deg	33
1.5	22	Dense	38 deg	42
	Refusal			



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Client: Escongweni BPH Engineers (Pty) Ltd **Ref.No.** 085-20

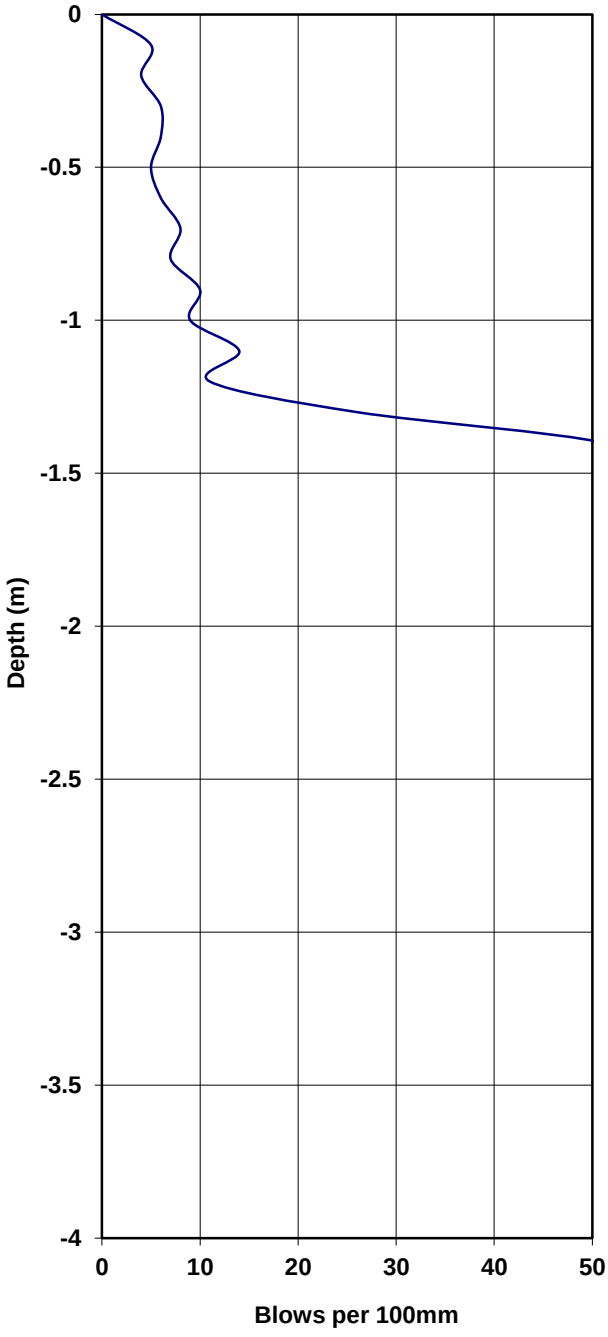
Project: Proposed Water Supply Scheme at Mpolweni **Date:** 15.05.2020

Section: Umgungundlovu District Municipality **Operator:** E.Dada-Mia

CBR Penetrometer Probe ---------- Test No. DC 30

THE STRENGTH AND CBR VALUES ARE EMPIRICAL AND DEPEND ON FACTORS SUCH AS MOISTURE CONTENT WHICH HAVE NOT BEEN DETERMINED. THEY ARE THEREFORE INDICATIVE ONLY AND SHOULD BE VERIFIED BY TEST OR OBSERVATION

Depth (m)	Blows/ 100mm	Inferred Consistency	Shear Strength	CBR %
0				
0.1	5	Firm	40 kPa	8
0.2	4	Soft	35 kPa	7
0.3	6	Firm	50 kPa	10
0.4	6	Firm	50 kPa	10
0.5	5	Firm	40 kPa	8
0.6	6	Firm	50 kPa	10
0.7	8	Firm	65 kPa	14
0.8	7	Firm	60 kPa	12
0.9	10	Stiff	85 kPa	17
1	9	Stiff	75 kPa	15
1.1	14	Stiff	115 kPa	25
1.2	11	Stiff	90 kPa	19
1.3	26	Very Stiff	>150 kPa	51
	Refusal			



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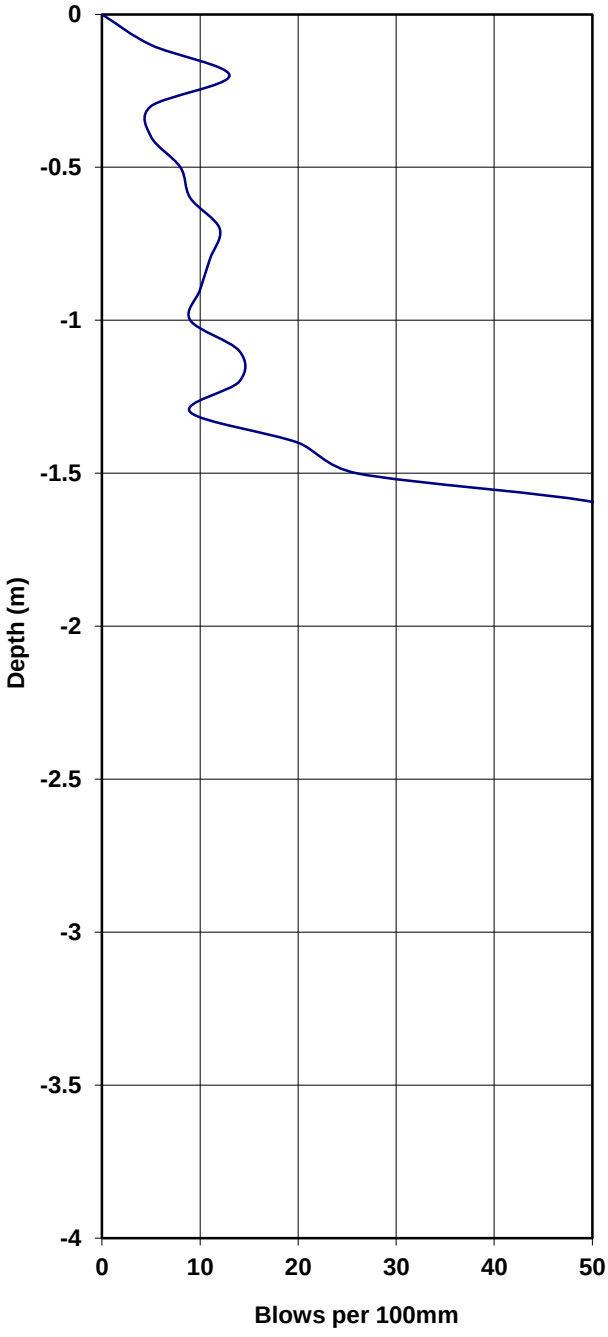
Project: Proposed Water Supply Scheme at Mpolweni **Date:** 15.05.2020

Section: Umgungundlovu District Municipality **Operator:** E.Dada-Mia

CBR Penetrometer Probe ---------- Test No. DC 31

THE STRENGTH AND CBR VALUES ARE EMPIRICAL AND DEPEND ON FACTORS SUCH AS MOISTURE CONTENT WHICH HAVE NOT BEEN DETERMINED. THEY ARE THEREFORE INDICATIVE ONLY AND SHOULD BE VERIFIED BY TEST OR OBSERVATION

Depth (m)	Blows/ 100mm	Inferred Consistency	Shear Strength	CBR %
0				
0.1	5	Med.Dense	32 deg	8
0.2	13	Dense	37 deg	23
0.3	5	Med.Dense	32 deg	8
0.4	5	Firm	40 kPa	8
0.5	8	Firm	65 kPa	14
0.6	9	Stiff	75 kPa	15
0.7	12	Stiff	100 kPa	21
0.8	11	Stiff	90 kPa	19
0.9	10	Stiff	85 kPa	17
1	9	Stiff	75 kPa	15
1.1	14	Dense	37 deg	25
1.2	14	Dense	37 deg	25
1.3	9	Med.Dense	35 deg	15
1.4	20	Dense	38 deg	37
1.5	26	Very Dense	>38 deg	51
	Refusal			



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GEOSURE (Pty) Ltd

Client: Escongweni BPH Engineers (Pty) Ltd **Ref.No.** 085-20

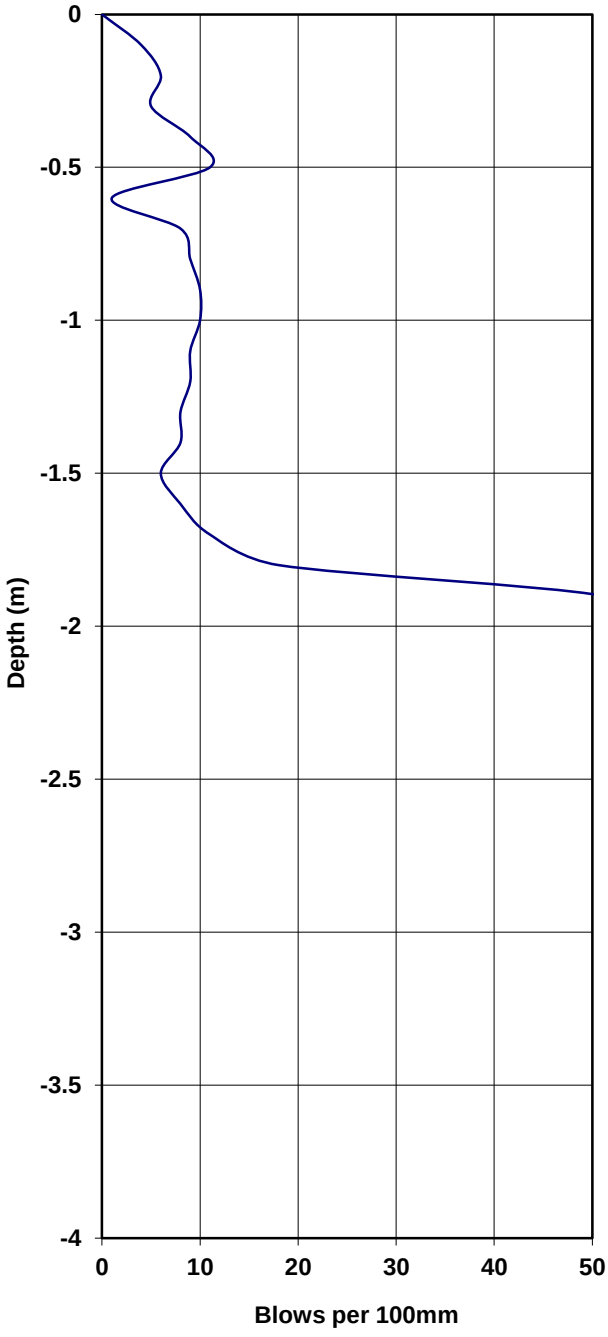
Project: Proposed Water Supply Scheme at Mpolweni **Date:** 15.05.2020

Section: Umgungundlovu District Municipality **Operator:** E.Dada-Mia

CBR Penetrometer Probe ---------- Test No. DC 32

THE STRENGTH AND CBR VALUES ARE EMPIRICAL AND DEPEND ON FACTORS SUCH AS MOISTURE CONTENT WHICH HAVE NOT BEEN DETERMINED. THEY ARE THEREFORE INDICATIVE ONLY AND SHOULD BE VERIFIED BY TEST OR OBSERVATION

Depth (m)	Blows/ 100mm	Inferred Consistency	Shear Strength	CBR %
0				
0.1	4	Med.Dense	30 deg	7
0.2	6	Med.Dense	33 deg	10
0.3	5	Med.Dense	32 deg	8
0.4	9	Med.Dense	35 deg	15
0.5	11	Dense	36 deg	19
0.6	1	Very Loose	<29 deg	2
0.7	8	Firm	65 kPa	14
0.8	9	Stiff	75 kPa	15
0.9	10	Stiff	85 kPa	17
1	10	Stiff	85 kPa	17
1.1	9	Stiff	75 kPa	15
1.2	9	Stiff	75 kPa	15
1.3	8	Firm	65 kPa	14
1.4	8	Firm	65 kPa	14
1.5	6	Firm	50 kPa	10
1.6	8	Firm	65 kPa	14
1.7	11	Stiff	90 kPa	19
1.8	18	Stiff	150 kPa	33
	Refusal			



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GEOSURE (Pty) Ltd

Client: Escongweni BPH Engineers (Pty) Ltd **Ref.No.** 085-20

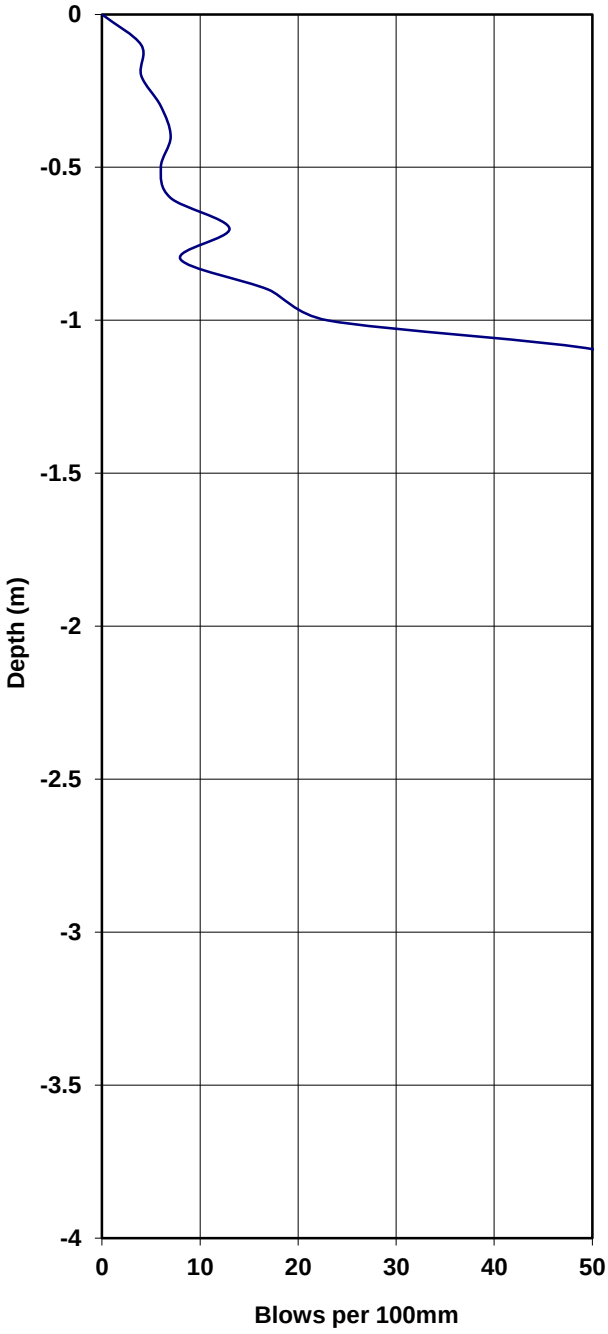
Project: Proposed Water Supply Scheme at Mpolweni **Date:** 15.05.2020

Section: Umgungundlovu District Municipality **Operator:** E.Dada-Mia

CBR Penetrometer Probe ---------- Test No. DC 33

THE STRENGTH AND CBR VALUES ARE EMPIRICAL AND DEPEND ON FACTORS SUCH AS MOISTURE CONTENT WHICH HAVE NOT BEEN DETERMINED. THEY ARE THEREFORE INDICATIVE ONLY AND SHOULD BE VERIFIED BY TEST OR OBSERVATION

Depth (m)	Blows/ 100mm	Inferred Consistency	Shear Strength	CBR %
0				
0.1	4	Med.Dense	30 deg	7
0.2	4	Med.Dense	30 deg	7
0.3	6	Med.Dense	33 deg	10
0.4	7	Med.Dense	34 deg	12
0.5	6	Med.Dense	33 deg	10
0.6	7	Med.Dense	34 deg	12
0.7	13	Dense	37 deg	23
0.8	8	Med.Dense	35 deg	14
0.9	17	Dense	37 deg	31
1	23	Dense	38 deg	44
	Refusal			



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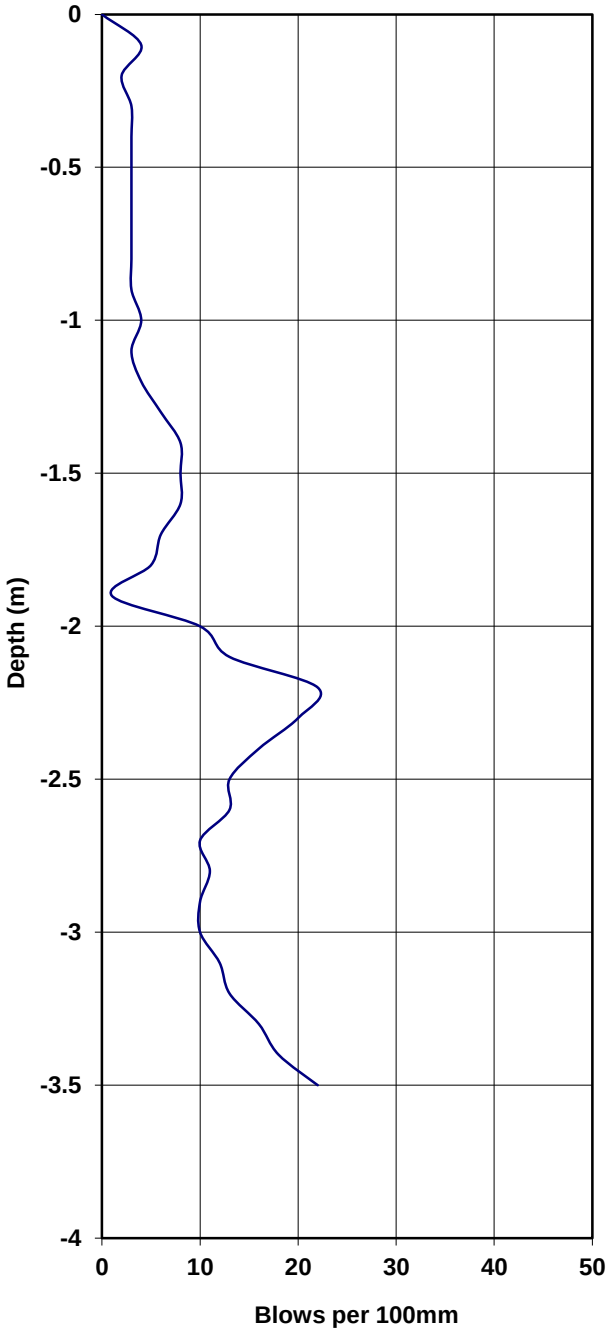
Project: Proposed Water Supply Scheme at Mpolweni **Date:** 15.05.2020

Section: Umgungundlovu District Municipality **Operator:** E.Dada-Mia

CBR Penetrometer Probe ---------- Test No. DC 34

THE STRENGTH AND CBR VALUES ARE EMPIRICAL AND DEPEND ON FACTORS SUCH AS MOISTURE CONTENT WHICH HAVE NOT BEEN DETERMINED. THEY ARE THEREFORE INDICATIVE ONLY AND SHOULD BE VERIFIED BY TEST OR OBSERVATION

Depth (m)	Blows/ 100mm	Inferred Consistency	Shear Strength	CBR %
0				
0.1	4	Med.Dense	30 deg	7
0.2	2	Loose	<30 deg	3
0.3	3	Loose	<30 deg	5
0.4	3	Loose	<30 deg	5
0.5	3	Loose	<30 deg	5
0.6	3	Soft	25 kPa	5
0.7	3	Soft	25 kPa	5
0.8	3	Soft	25 kPa	5
0.9	3	Soft	25 kPa	5
1	4	Soft	35 kPa	7
1.1	3	Soft	25 kPa	5
1.2	4	Soft	35 kPa	7
1.3	6	Firm	50 kPa	10
1.4	8	Firm	65 kPa	14
1.5	8	Firm	65 kPa	14
1.6	8	Firm	65 kPa	14
1.7	6	Firm	50 kPa	10
1.8	5	Firm	40 kPa	8
1.9	1	Very Soft	<20 kPa	2
2	10	Stiff	85 kPa	17
2.1	13	Stiff	110 kPa	23
2.2	22	Very Stiff	>150 kPa	42
2.3	20	Very Stiff	>150 kPa	37
2.4	16	Stiff	130 kPa	29
2.5	13	Stiff	110 kPa	23
2.6	13	Stiff	110 kPa	23
2.7	10	Stiff	85 kPa	17
2.8	11	Stiff	90 kPa	19
2.9	10	Stiff	85 kPa	17
3	10	Stiff	85 kPa	17
3.1	12	Stiff	100 kPa	21
3.2	13	Stiff	110 kPa	23
3.3	16	Stiff	130 kPa	29
3.4	18	Stiff	150 kPa	33
3.5	22	Very Stiff	>150 kPa	42
	End			



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GEOSURE (Pty) Ltd

Client: Escongweni BPH Engineers (Pty) Ltd **Ref.No.** 085-20

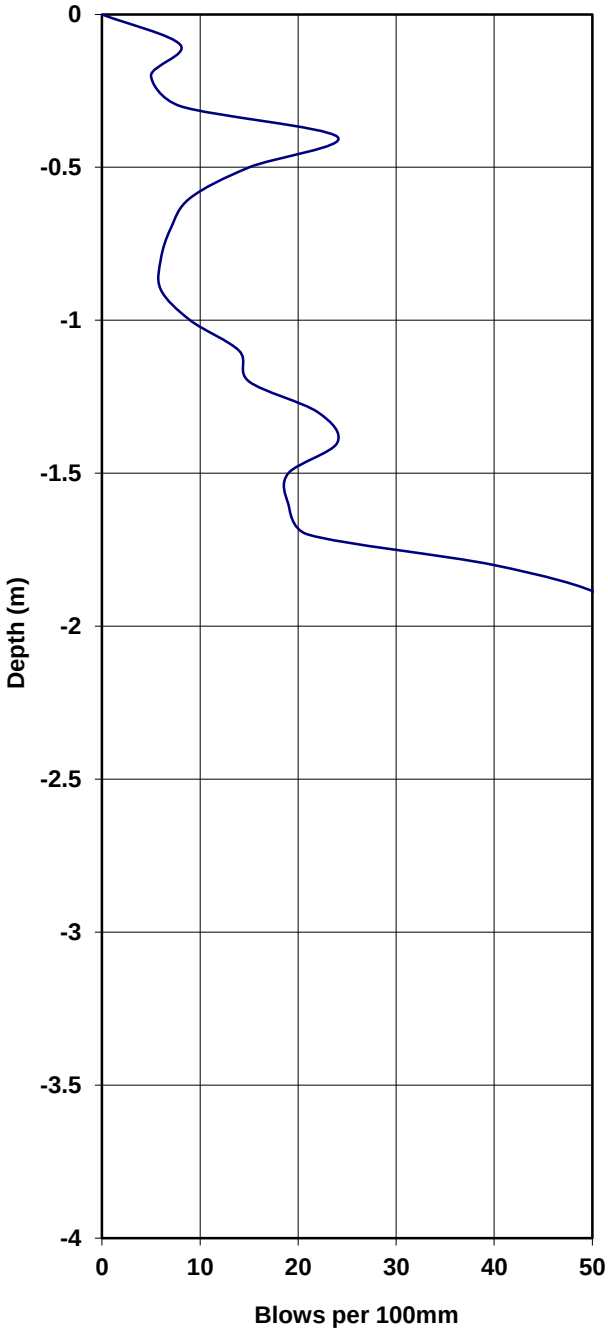
Project: Proposed Water Supply Scheme at Mpolweni **Date:** 15.05.2020

Section: Umgungundlovu District Municipality **Operator:** E.Dada-Mia

CBR Penetrometer Probe ---------- Test No. DC 35

THE STRENGTH AND CBR VALUES ARE EMPIRICAL AND DEPEND ON FACTORS SUCH AS MOISTURE CONTENT WHICH HAVE NOT BEEN DETERMINED. THEY ARE THEREFORE INDICATIVE ONLY AND SHOULD BE VERIFIED BY TEST OR OBSERVATION

Depth (m)	Blows/ 100mm	Inferred Consistency	Shear Strength	CBR %
0				
0.1	8	Med.Dense	35 deg	14
0.2	5	Med.Dense	32 deg	8
0.3	8	Med.Dense	35 deg	14
0.4	24	Dense	38 deg	47
0.5	15	Dense	37 deg	27
0.6	9	Stiff	75 kPa	15
0.7	7	Firm	60 kPa	12
0.8	6	Firm	50 kPa	10
0.9	6	Firm	50 kPa	10
1	9	Stiff	75 kPa	15
1.1	14	Stiff	115 kPa	25
1.2	15	Stiff	125 kPa	27
1.3	22	Very Stiff	>150 kPa	42
1.4	24	Very Stiff	>150 kPa	47
1.5	19	Very Stiff	>150 kPa	35
1.6	19	Dense	37 deg	35
1.7	21	Dense	38 deg	40
1.8	40	Very Dense	>38 deg	>55
	Refusal			



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Consulting Engineering Geologists, Geotechnical Engineers, Geotechnicians & Geotechnical Quality Assurance Specialists

GEOSURE (Pty) Ltd

Client: Escongweni BPH Engineers (Pty) Ltd **Ref.No.** 085-20

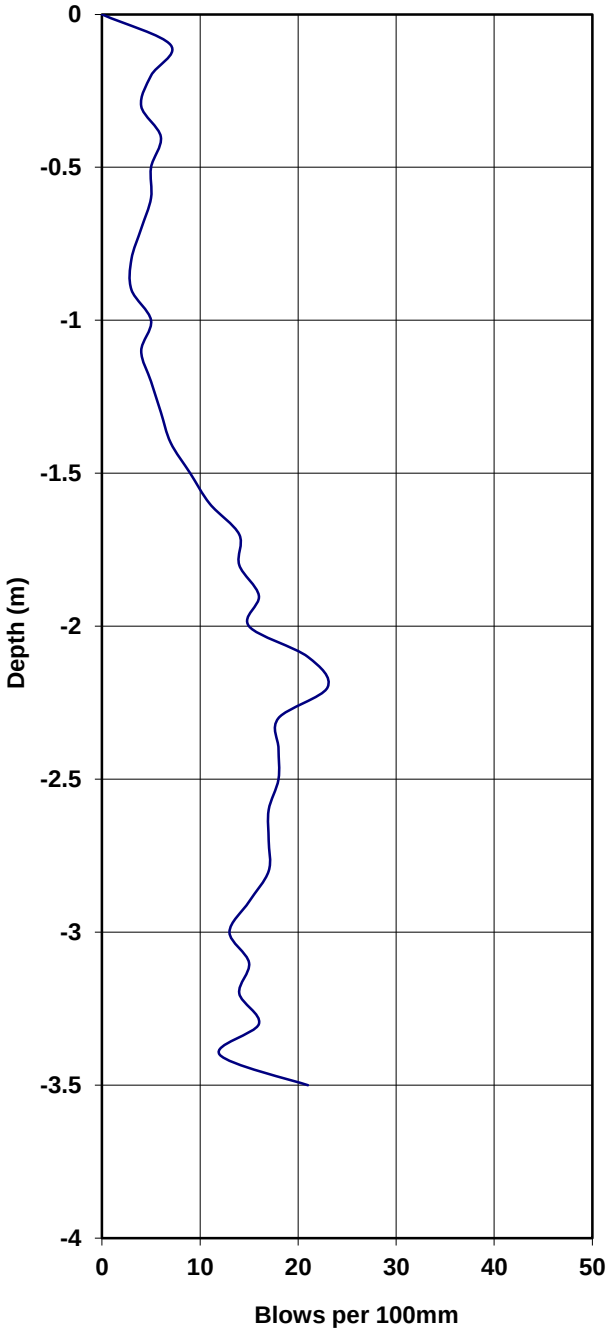
Project: Proposed Water Supply Scheme at Mpolweni **Date:** 15.05.2020

Section: Umgungundlovu District Municipality **Operator:** E.Dada-Mia

CBR Penetrometer Probe ---------- Test No. DC 36

THE STRENGTH AND CBR VALUES ARE EMPIRICAL AND DEPEND ON FACTORS SUCH AS MOISTURE CONTENT WHICH HAVE NOT BEEN DETERMINED. THEY ARE THEREFORE INDICATIVE ONLY AND SHOULD BE VERIFIED BY TEST OR OBSERVATION

Depth (m)	Blows/ 100mm	Inferred Consistency	Shear Strength	CBR %
0				
0.1	7	Med.Dense	34 deg	12
0.2	5	Med.Dense	32 deg	8
0.3	4	Med.Dense	30 deg	7
0.4	6	Med.Dense	33 deg	10
0.5	5	Firm	40 kPa	8
0.6	5	Firm	40 kPa	8
0.7	4	Soft	35 kPa	7
0.8	3	Soft	25 kPa	5
0.9	3	Soft	25 kPa	5
1	5	Firm	40 kPa	8
1.1	4	Soft	35 kPa	7
1.2	5	Firm	40 kPa	8
1.3	6	Firm	50 kPa	10
1.4	7	Firm	60 kPa	12
1.5	9	Stiff	75 kPa	15
1.6	11	Stiff	90 kPa	19
1.7	14	Stiff	115 kPa	25
1.8	14	Stiff	115 kPa	25
1.9	16	Stiff	130 kPa	29
2	15	Stiff	125 kPa	27
2.1	21	Very Stiff	>150 kPa	40
2.2	23	Very Stiff	>150 kPa	44
2.3	18	Stiff	150 kPa	33
2.4	18	Stiff	150 kPa	33
2.5	18	Stiff	150 kPa	33
2.6	17	Stiff	140 kPa	31
2.7	17	Stiff	140 kPa	31
2.8	17	Stiff	140 kPa	31
2.9	15	Stiff	125 kPa	27
3	13	Stiff	110 kPa	23
3.1	15	Stiff	125 kPa	27
3.2	14	Stiff	115 kPa	25
3.3	16	Stiff	130 kPa	29
3.4	12	Stiff	100 kPa	21
3.5	21	Very Stiff	>150 kPa	40
	End			



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GEOSURE (Pty) Ltd

Client: Escongweni BPH Engineers (Pty) Ltd **Ref.No.** 085-20

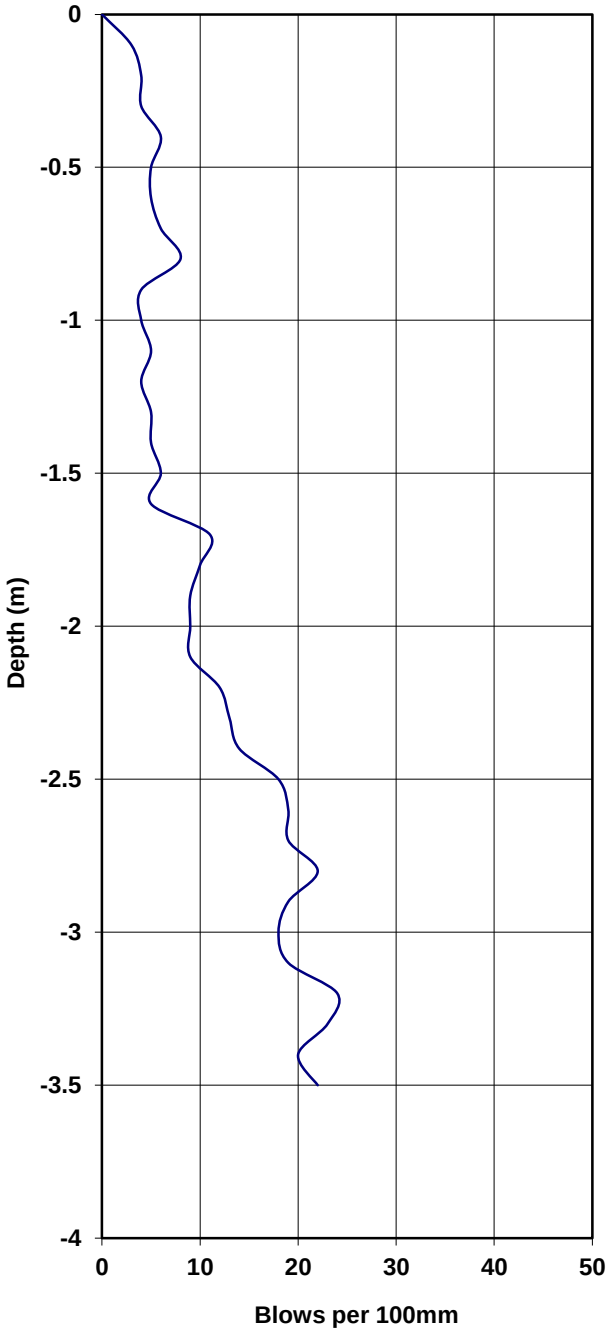
Project: Proposed Water Supply Scheme at Mpolweni **Date:** 15.05.2020

Section: Umgungundlovu District Municipality **Operator:** E.Dada-Mia

CBR Penetrometer Probe ---------- Test No. DC 37

THE STRENGTH AND CBR VALUES ARE EMPIRICAL AND DEPEND ON FACTORS SUCH AS MOISTURE CONTENT WHICH HAVE NOT BEEN DETERMINED. THEY ARE THEREFORE INDICATIVE ONLY AND SHOULD BE VERIFIED BY TEST OR OBSERVATION

Depth (m)	Blows/ 100mm	Inferred Consistency	Shear Strength	CBR %
0				
0.1	3	Loose	<30 deg	5
0.2	4	Med.Dense	30 deg	7
0.3	4	Med.Dense	30 deg	7
0.4	6	Med.Dense	33 deg	10
0.5	5	Med.Dense	32 deg	8
0.6	5	Med.Dense	32 deg	8
0.7	6	Med.Dense	33 deg	10
0.8	8	Firm	65 kPa	14
0.9	4	Soft	35 kPa	7
1	4	Soft	35 kPa	7
1.1	5	Firm	40 kPa	8
1.2	4	Soft	35 kPa	7
1.3	5	Firm	40 kPa	8
1.4	5	Firm	40 kPa	8
1.5	6	Firm	50 kPa	10
1.6	5	Firm	40 kPa	8
1.7	11	Stiff	90 kPa	19
1.8	10	Stiff	85 kPa	17
1.9	9	Stiff	75 kPa	15
2	9	Stiff	75 kPa	15
2.1	9	Stiff	75 kPa	15
2.2	12	Stiff	100 kPa	21
2.3	13	Stiff	110 kPa	23
2.4	14	Stiff	115 kPa	25
2.5	18	Stiff	150 kPa	33
2.6	19	Very Stiff	>150 kPa	35
2.7	19	Very Stiff	>150 kPa	35
2.8	22	Very Stiff	>150 kPa	42
2.9	19	Very Stiff	>150 kPa	35
3	18	Stiff	150 kPa	33
3.1	19	Very Stiff	>150 kPa	35
3.2	24	Very Stiff	>150 kPa	47
3.3	23	Very Stiff	>150 kPa	44
3.4	20	Very Stiff	>150 kPa	37
3.5	22	Very Stiff	>150 kPa	42
	End			



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GEOSURE (Pty) Ltd

Client: Escongweni BPH Engineers (Pty) Ltd **Ref.No.** 085-20

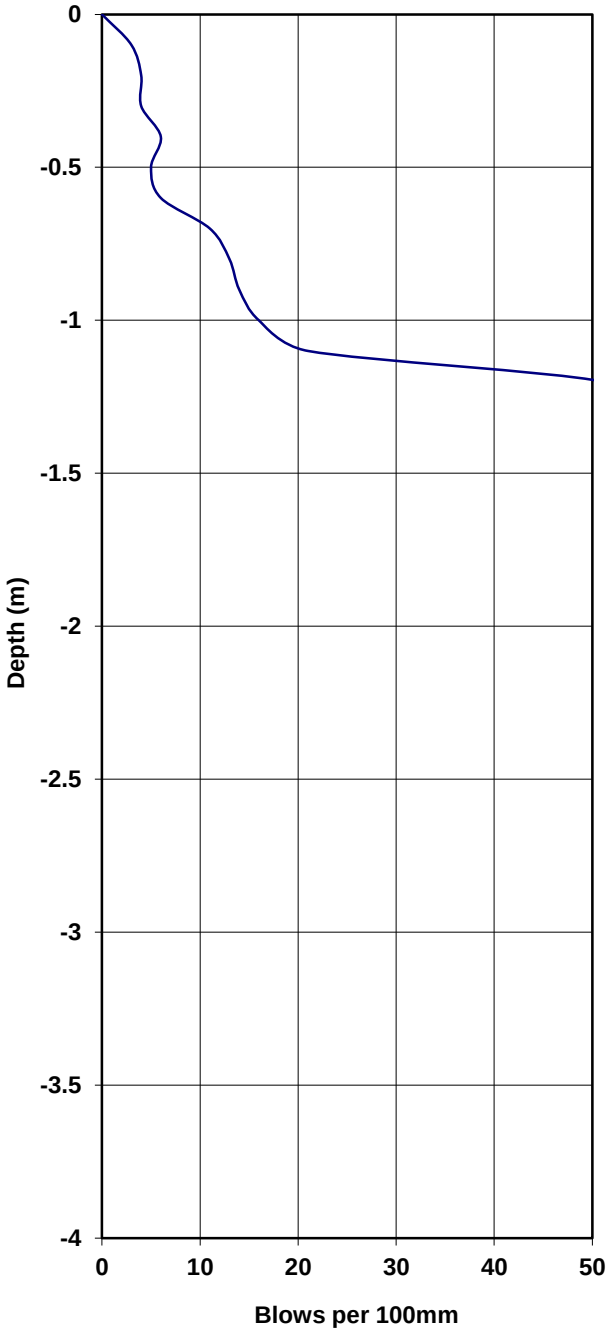
Project: Proposed Water Supply Scheme at Mpolweni **Date:** 15.05.2020

Section: Umgungundlovu District Municipality **Operator:** E.Dada-Mia

CBR Penetrometer Probe ---------- Test No. DC 38

THE STRENGTH AND CBR VALUES ARE EMPIRICAL AND DEPEND ON FACTORS SUCH AS MOISTURE CONTENT WHICH HAVE NOT BEEN DETERMINED. THEY ARE THEREFORE INDICATIVE ONLY AND SHOULD BE VERIFIED BY TEST OR OBSERVATION

Depth (m)	Blows/ 100mm	Inferred Consistency	Shear Strength	CBR %
0				
0.1	3	Loose	<30 deg	5
0.2	4	Med.Dense	30 deg	7
0.3	4	Med.Dense	30 deg	7
0.4	6	Med.Dense	33 deg	10
0.5	5	Med.Dense	32 deg	8
0.6	6	Firm	50 kPa	10
0.7	11	Stiff	90 kPa	19
0.8	13	Stiff	110 kPa	23
0.9	14	Stiff	115 kPa	25
1	16	Stiff	130 kPa	29
1.1	21	Very Stiff	>150 kPa	40
	Refusal			



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GEOSURE (Pty) Ltd

Client: Escongweni BPH Engineers (Pty) Ltd **Ref.No.** 085-20

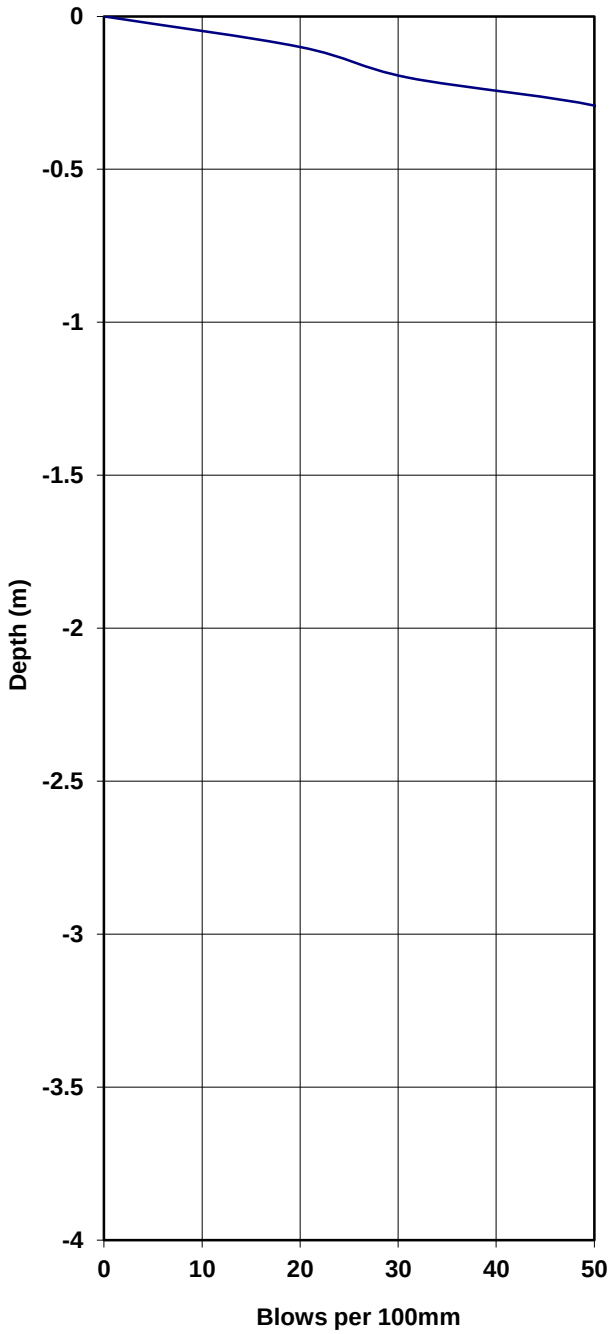
Project: Proposed Water Supply Scheme at Mpolweni **Date:** 15.05.2020

Section: Umgungundlovu District Municipality **Operator:** E.Dada-Mia

CBR Penetrometer Probe ---------- Test No. DC 39

THE STRENGTH AND CBR VALUES ARE EMPIRICAL AND DEPEND ON FACTORS SUCH AS MOISTURE CONTENT WHICH HAVE NOT BEEN DETERMINED. THEY ARE THEREFORE INDICATIVE ONLY AND SHOULD BE VERIFIED BY TEST OR OBSERVATION

Depth (m)	Blows/ 100mm	Inferred Consistency	Shear Strength	CBR %
0				
0.1	20	Dense	38 deg	37
0.2	31	Very Dense	>38 deg	>55
	Refusal			



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GEOSURE (Pty) Ltd

Client: Escongweni BPH Engineers (Pty) Ltd **Ref.No.** 085-20

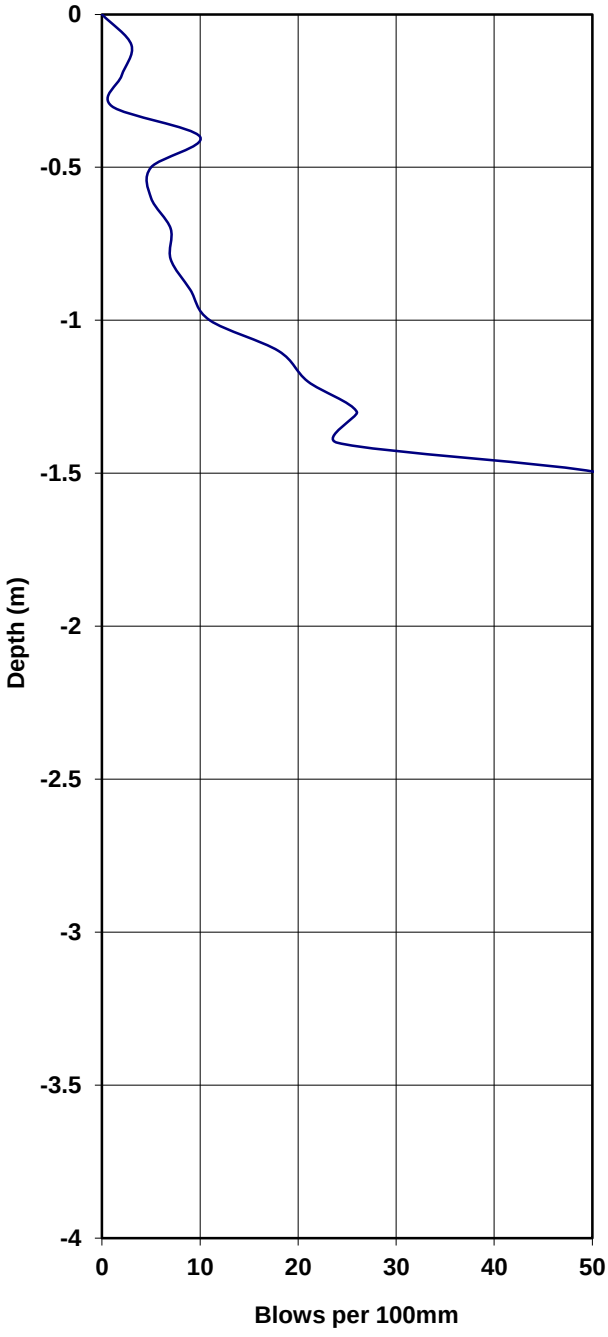
Project: Proposed Water Supply Scheme at Mpolweni **Date:** 15.05.2020

Section: Umgungundlovu District Municipality **Operator:** E.Dada-Mia

CBR Penetrometer Probe ---------- Test No. DC 40

THE STRENGTH AND CBR VALUES ARE EMPIRICAL AND DEPEND ON FACTORS SUCH AS MOISTURE CONTENT WHICH HAVE NOT BEEN DETERMINED. THEY ARE THEREFORE INDICATIVE ONLY AND SHOULD BE VERIFIED BY TEST OR OBSERVATION

Depth (m)	Blows/ 100mm	Inferred Consistency	Shear Strength	CBR %
0				
0.1	3	Loose	<30 deg	5
0.2	2	Loose	<30 deg	3
0.3	1	Very Loose	<29 deg	2
0.4	10	Med.Dense	36 deg	17
0.5	5	Med.Dense	32 deg	8
0.6	5	Med.Dense	32 deg	8
0.7	7	Med.Dense	34 deg	12
0.8	7	Med.Dense	34 deg	12
0.9	9	Med.Dense	35 deg	15
1	11	Dense	36 deg	19
1.1	18	Dense	37 deg	33
1.2	21	Dense	38 deg	40
1.3	26	Very Dense	>38 deg	51
1.4	24	Dense	38 deg	47
	Refusal			



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GEOSURE (Pty) Ltd

Client: Escongweni BPH Engineers (Pty) Ltd **Ref.No.** 085-20

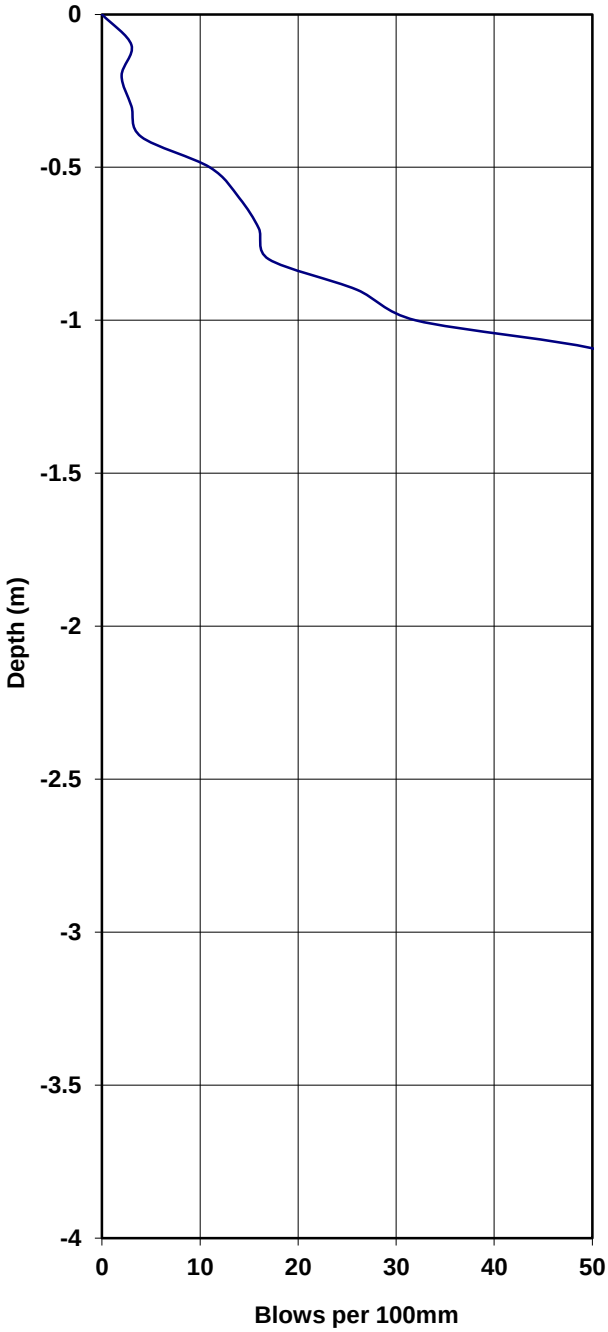
Project: Proposed Water Supply Scheme at Mpolweni **Date:** 15.05.2020

Section: Umgungundlovu District Municipality **Operator:** E.Dada-Mia

CBR Penetrometer Probe ---------- Test No. DC 41

THE STRENGTH AND CBR VALUES ARE EMPIRICAL AND DEPEND ON FACTORS SUCH AS MOISTURE CONTENT WHICH HAVE NOT BEEN DETERMINED. THEY ARE THEREFORE INDICATIVE ONLY AND SHOULD BE VERIFIED BY TEST OR OBSERVATION

Depth (m)	Blows/ 100mm	Inferred Consistency	Shear Strength	CBR %
0				
0.1	3	Loose	<30 deg	5
0.2	2	Loose	<30 deg	3
0.3	3	Loose	<30 deg	5
0.4	4	Med.Dense	30 deg	7
0.5	11	Dense	36 deg	19
0.6	14	Dense	37 deg	25
0.7	16	Dense	37 deg	29
0.8	17	Dense	37 deg	31
0.9	26	Very Dense	>38 deg	51
1	32	Very Dense	>38 deg	>55
	Refusal			



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GEOSURE (Pty) Ltd

Client: Escongweni BPH Engineers (Pty) Ltd **Ref.No.** 085-20

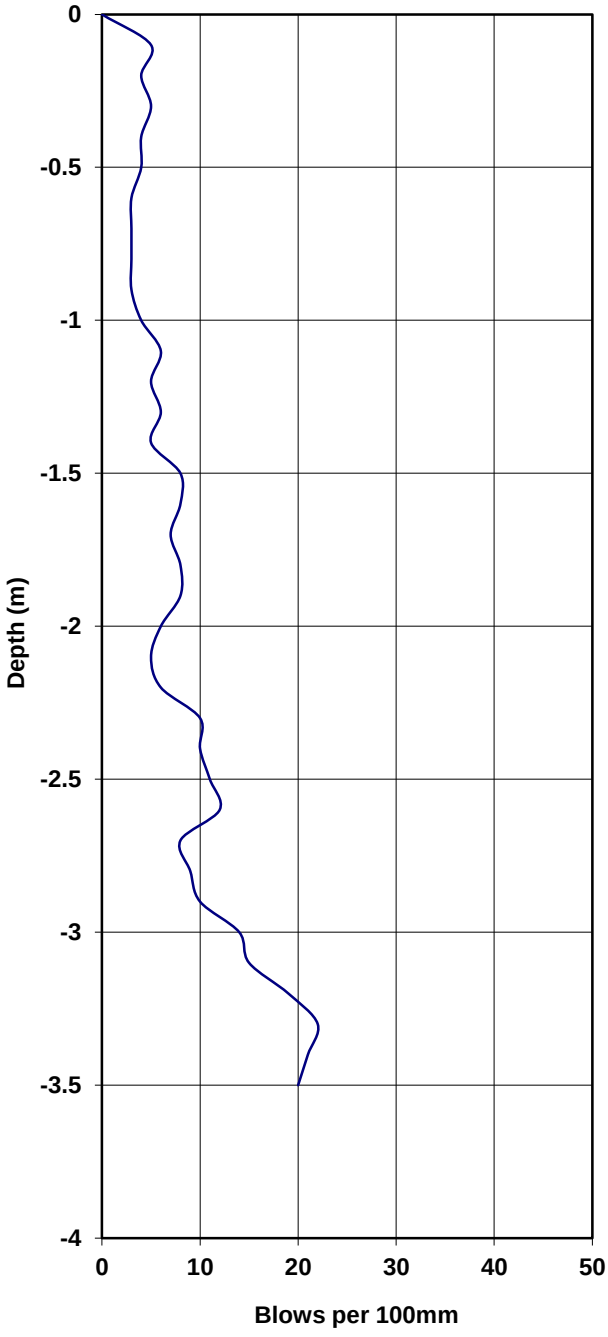
Project: Proposed Water Supply Scheme at Mpolweni **Date:** 15.05.2020

Section: Umgungundlovu District Municipality **Operator:** E.Dada-Mia

CBR Penetrometer Probe ---------- Test No. DC 42

THE STRENGTH AND CBR VALUES ARE EMPIRICAL AND DEPEND ON FACTORS SUCH AS MOISTURE CONTENT WHICH HAVE NOT BEEN DETERMINED. THEY ARE THEREFORE INDICATIVE ONLY AND SHOULD BE VERIFIED BY TEST OR OBSERVATION

Depth (m)	Blows/ 100mm	Inferred Consistency	Shear Strength	CBR %
0				
0.1	5	Firm	40 kPa	8
0.2	4	Soft	35 kPa	7
0.3	5	Firm	40 kPa	8
0.4	4	Soft	35 kPa	7
0.5	4	Soft	35 kPa	7
0.6	3	Soft	25 kPa	5
0.7	3	Soft	25 kPa	5
0.8	3	Soft	25 kPa	5
0.9	3	Soft	25 kPa	5
1	4	Soft	35 kPa	7
1.1	6	Firm	50 kPa	10
1.2	5	Firm	40 kPa	8
1.3	6	Firm	50 kPa	10
1.4	5	Firm	40 kPa	8
1.5	8	Firm	65 kPa	14
1.6	8	Firm	65 kPa	14
1.7	7	Firm	60 kPa	12
1.8	8	Firm	65 kPa	14
1.9	8	Firm	65 kPa	14
2	6	Firm	50 kPa	10
2.1	5	Firm	40 kPa	8
2.2	6	Firm	50 kPa	10
2.3	10	Stiff	85 kPa	17
2.4	10	Stiff	85 kPa	17
2.5	11	Stiff	90 kPa	19
2.6	12	Stiff	100 kPa	21
2.7	8	Firm	65 kPa	14
2.8	9	Stiff	75 kPa	15
2.9	10	Stiff	85 kPa	17
3	14	Stiff	115 kPa	25
3.1	15	Stiff	125 kPa	27
3.2	19	Very Stiff	>150 kPa	35
3.3	22	Very Stiff	>150 kPa	42
3.4	21	Very Stiff	>150 kPa	40
3.5	20	Very Stiff	>150 kPa	37
	End			



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GEOSURE (Pty) Ltd

Client: Escongweni BPH Engineers (Pty) Ltd **Ref.No.** 085-20

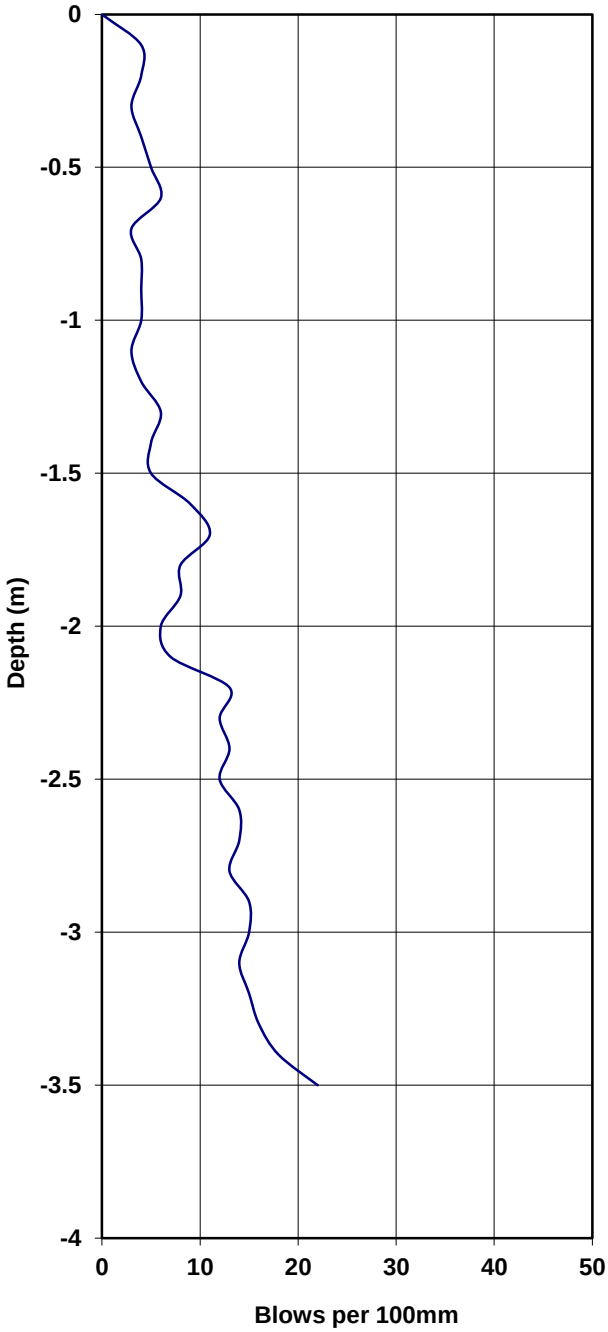
Project: Proposed Water Supply Scheme at Mpolweni **Date:** 15.05.2020

Section: Umgungundlovu District Municipality **Operator:** E.Dada-Mia

CBR Penetrometer Probe ---------- Test No. DC 43

THE STRENGTH AND CBR VALUES ARE EMPIRICAL AND DEPEND ON FACTORS SUCH AS MOISTURE CONTENT WHICH HAVE NOT BEEN DETERMINED. THEY ARE THEREFORE INDICATIVE ONLY AND SHOULD BE VERIFIED BY TEST OR OBSERVATION

Depth (m)	Blows/ 100mm	Inferred Consistency	Shear Strength	CBR %
0				
0.1	4	Soft	35 kPa	7
0.2	4	Soft	35 kPa	7
0.3	3	Soft	25 kPa	5
0.4	4	Soft	35 kPa	7
0.5	5	Firm	40 kPa	8
0.6	6	Firm	50 kPa	10
0.7	3	Soft	25 kPa	5
0.8	4	Soft	35 kPa	7
0.9	4	Soft	35 kPa	7
1	4	Soft	35 kPa	7
1.1	3	Soft	25 kPa	5
1.2	4	Soft	35 kPa	7
1.3	6	Firm	50 kPa	10
1.4	5	Firm	40 kPa	8
1.5	5	Firm	40 kPa	8
1.6	9	Stiff	75 kPa	15
1.7	11	Stiff	90 kPa	19
1.8	8	Firm	65 kPa	14
1.9	8	Firm	65 kPa	14
2	6	Firm	50 kPa	10
2.1	7	Firm	60 kPa	12
2.2	13	Stiff	110 kPa	23
2.3	12	Stiff	100 kPa	21
2.4	13	Stiff	110 kPa	23
2.5	12	Stiff	100 kPa	21
2.6	14	Stiff	115 kPa	25
2.7	14	Stiff	115 kPa	25
2.8	13	Stiff	110 kPa	23
2.9	15	Stiff	125 kPa	27
3	15	Stiff	125 kPa	27
3.1	14	Stiff	115 kPa	25
3.2	15	Stiff	125 kPa	27
3.3	16	Stiff	130 kPa	29
3.4	18	Stiff	150 kPa	33
3.5	22	Very Stiff	>150 kPa	42
	End			



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GEOSURE (Pty) Ltd

Client: Escongweni BPH Engineers (Pty) Ltd **Ref.No.** 085-20

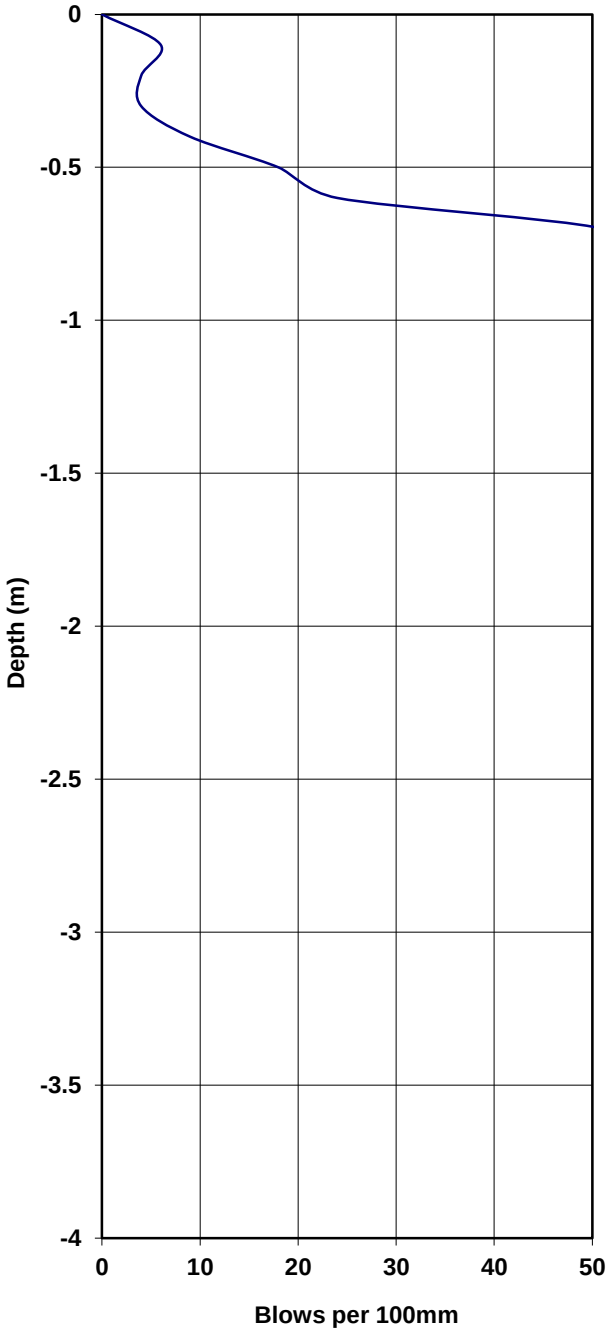
Project: Proposed Water Supply Scheme at Mpolweni **Date:** 15.05.2020

Section: Umgungundlovu District Municipality **Operator:** E.Dada-Mia

CBR Penetrometer Probe ---------- Test No. DC 44

THE STRENGTH AND CBR VALUES ARE EMPIRICAL AND DEPEND ON FACTORS SUCH AS MOISTURE CONTENT WHICH HAVE NOT BEEN DETERMINED. THEY ARE THEREFORE INDICATIVE ONLY AND SHOULD BE VERIFIED BY TEST OR OBSERVATION

Depth (m)	Blows/ 100mm	Inferred Consistency	Shear Strength	CBR %
0				
0.1	6	Med.Dense	33 deg	10
0.2	4	Med.Dense	30 deg	7
0.3	4	Med.Dense	30 deg	7
0.4	9	Med.Dense	35 deg	15
0.5	18	Dense	37 deg	33
0.6	24	Dense	38 deg	47
	Refusal			



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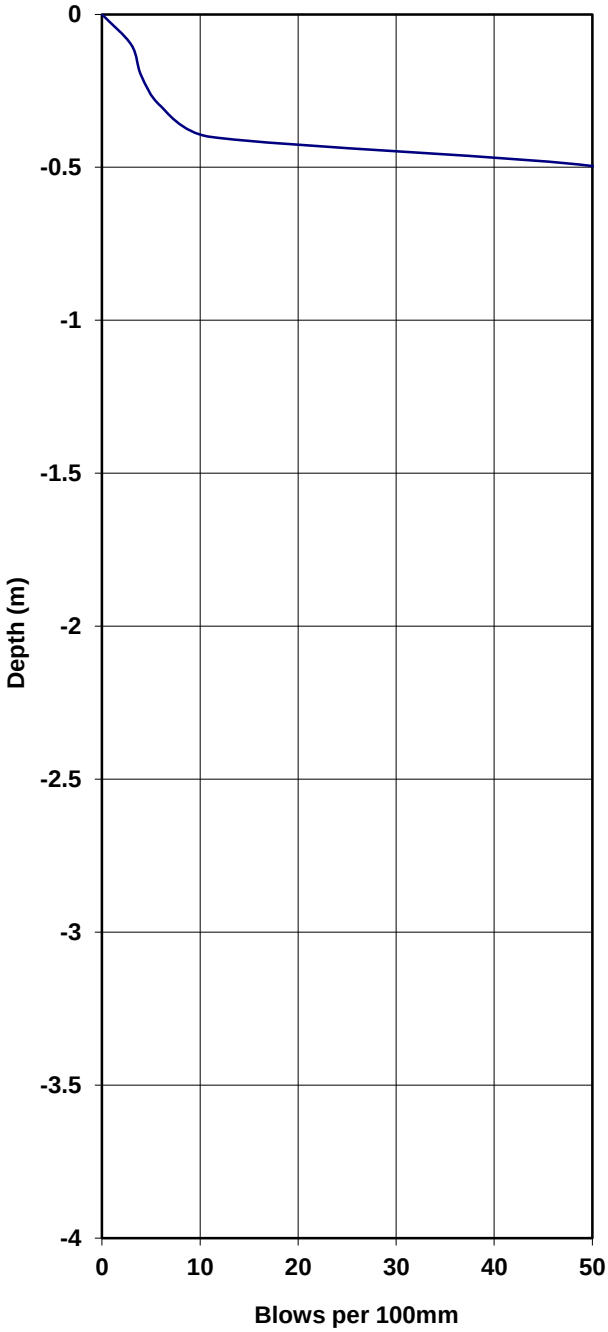
Project: Proposed Water Supply Scheme at Mpolweni **Date:** 15.05.2020

Section: Umgungundlovu District Municipality **Operator:** E.Dada-Mia

CBR Penetrometer Probe ---------- Test No. DC 45

THE STRENGTH AND CBR VALUES ARE EMPIRICAL AND DEPEND ON FACTORS SUCH AS MOISTURE CONTENT WHICH HAVE NOT BEEN DETERMINED. THEY ARE THEREFORE INDICATIVE ONLY AND SHOULD BE VERIFIED BY TEST OR OBSERVATION

Depth (m)	Blows/ 100mm	Inferred Consistency	Shear Strength	CBR %
0				
0.1	3	Loose	<30 deg	5
0.2	4	Med.Dense	30 deg	7
0.3	6	Med.Dense	33 deg	10
0.4	11	Dense	36 deg	19
	Refusal			



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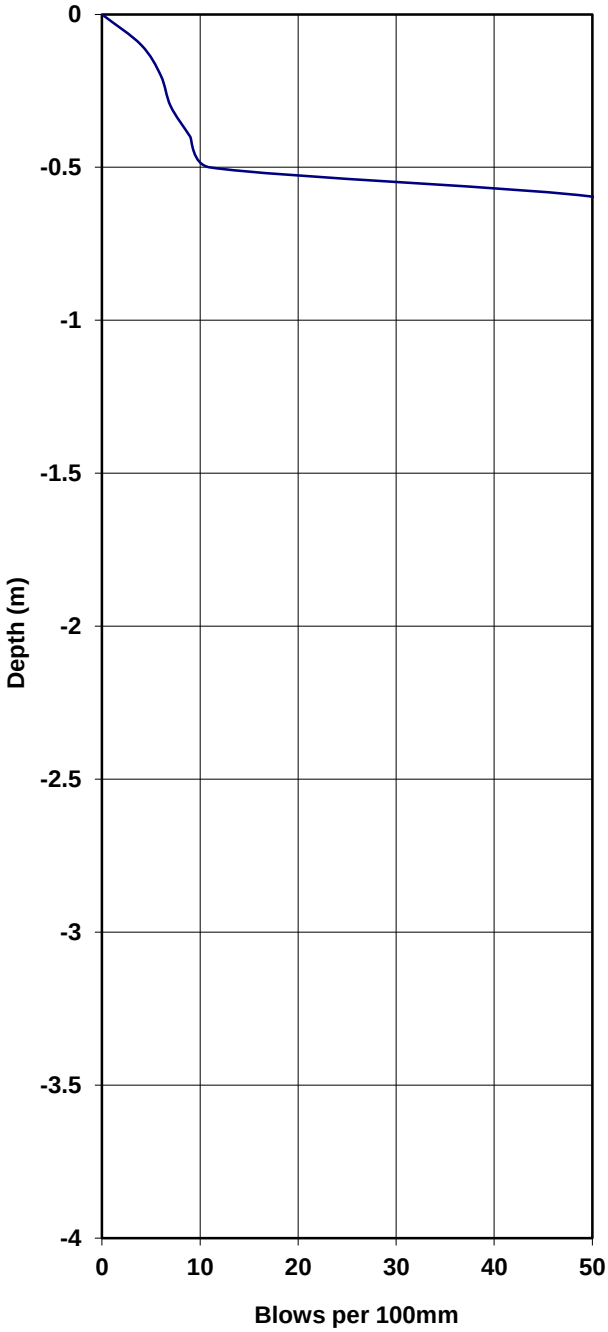
Project: Proposed Water Supply Scheme at Mpolweni **Date:** 15.05.2020

Section: Umgungundlovu District Municipality **Operator:** E.Dada-Mia

CBR Penetrometer Probe ---------- Test No. DC 46

THE STRENGTH AND CBR VALUES ARE EMPIRICAL AND DEPEND ON FACTORS SUCH AS MOISTURE CONTENT WHICH HAVE NOT BEEN DETERMINED. THEY ARE THEREFORE INDICATIVE ONLY AND SHOULD BE VERIFIED BY TEST OR OBSERVATION

Depth (m)	Blows/ 100mm	Inferred Consistency	Shear Strength	CBR %
0				
0.1	4	Med.Dense	30 deg	7
0.2	6	Med.Dense	33 deg	10
0.3	7	Med.Dense	34 deg	12
0.4	9	Med.Dense	35 deg	15
0.5	11	Dense	36 deg	19
	Refusal			



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GEOSURE (Pty) Ltd

Client: Escongweni BPH Engineers (Pty) Ltd **Ref.No.** 085-20

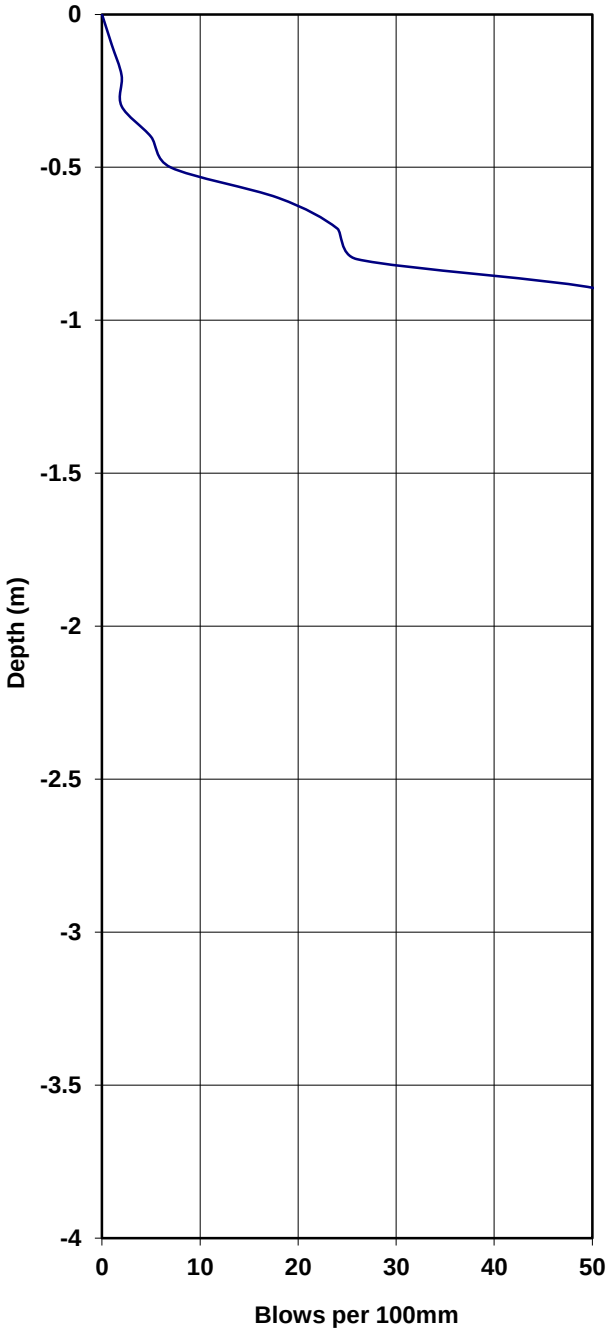
Project: Proposed Water Supply Scheme at Mpolweni **Date:** 15.05.2020

Section: Umgungundlovu District Municipality **Operator:** E.Dada-Mia

CBR Penetrometer Probe ---------- Test No. DC 47

THE STRENGTH AND CBR VALUES ARE EMPIRICAL AND DEPEND ON FACTORS SUCH AS MOISTURE CONTENT WHICH HAVE NOT BEEN DETERMINED. THEY ARE THEREFORE INDICATIVE ONLY AND SHOULD BE VERIFIED BY TEST OR OBSERVATION

Depth (m)	Blows/ 100mm	Inferred Consistency	Shear Strength	CBR %
0				
0.1	1	Very Loose	<29 deg	2
0.2	2	Loose	<30 deg	3
0.3	2	Loose	<30 deg	3
0.4	5	Med.Dense	32 deg	8
0.5	7	Med.Dense	34 deg	12
0.6	18	Dense	37 deg	33
0.7	24	Dense	38 deg	47
0.8	26	Very Dense	>38 deg	51
	Refusal			



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GEOSURE (Pty) Ltd

Client: Escongweni BPH Engineers (Pty) Ltd **Ref.No.** 085-20

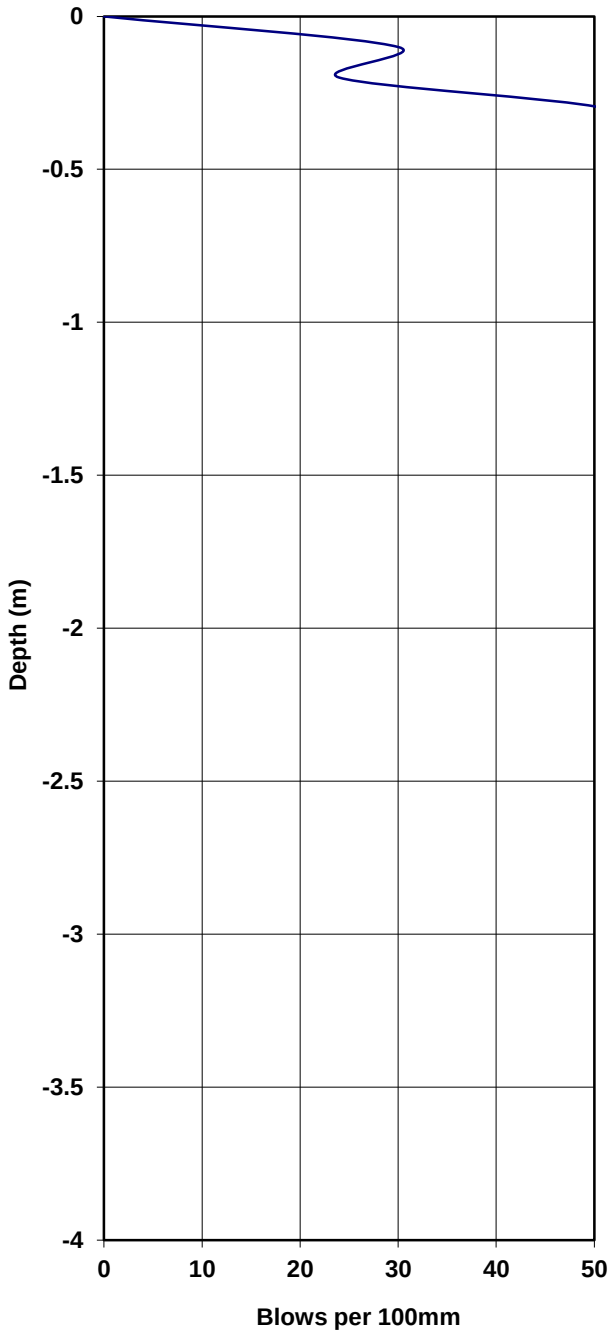
Project: Proposed Water Supply Scheme at Mpolweni **Date:** 15.05.2020

Section: Umgungundlovu District Municipality **Operator:** E.Dada-Mia

CBR Penetrometer Probe ---------- Test No. DC 48

THE STRENGTH AND CBR VALUES ARE EMPIRICAL AND DEPEND ON FACTORS SUCH AS MOISTURE CONTENT WHICH HAVE NOT BEEN DETERMINED. THEY ARE THEREFORE INDICATIVE ONLY AND SHOULD BE VERIFIED BY TEST OR OBSERVATION

Depth (m)	Blows/ 100mm	Inferred Consistency	Shear Strength	CBR %
0				
0.1	30	Very Dense	>38 deg	>55
0.2	24	Dense	38 deg	47
	Refusal			



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Geotechnical Engineering Consultants

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Consulting Engineering Geologists, Geotechnical Engineers, Geotechnicians & Geotechnical Quality Assurance Specialists

GEOSURE (Pty) Ltd

Client: Escongweni BPH Engineers (Pty) Ltd

Project: Proposed Water Supply Scheme at Mpolweni

Section: Umgungundlovu District Municipality

Ref.No. 085-20

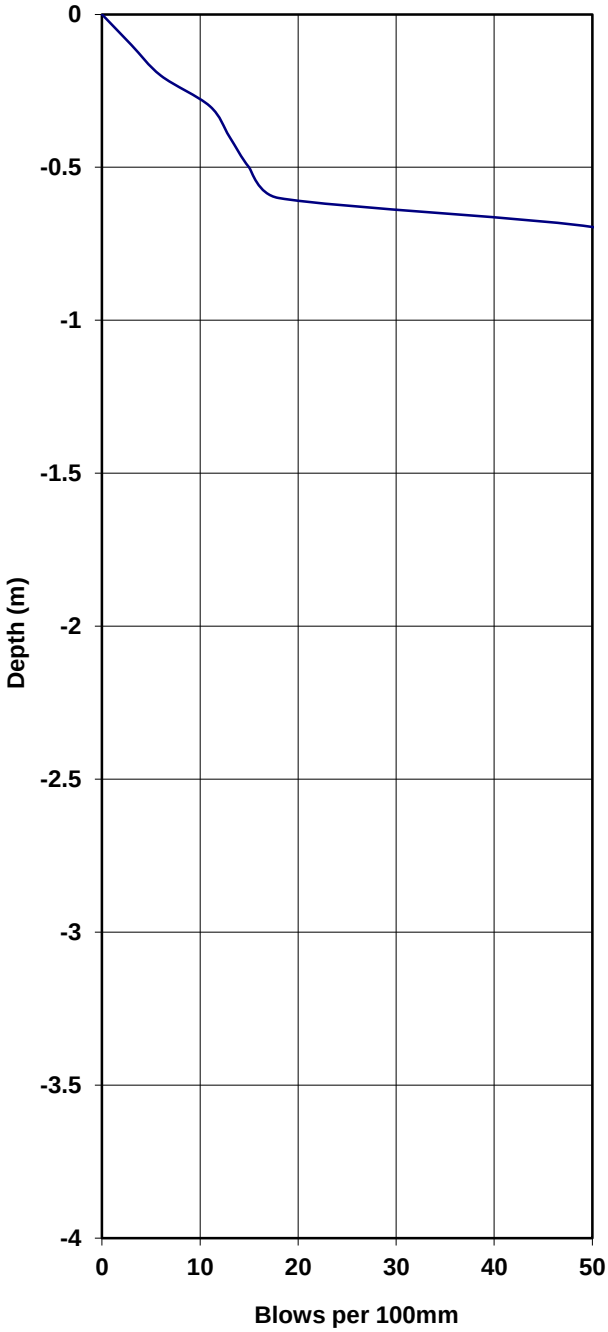
Date: 15.05.2020

Operator: E.Dada-Mia

CBR Penetrometer Probe ---------- Test No. DC 49

THE STRENGTH AND CBR VALUES ARE EMPIRICAL AND DEPEND ON FACTORS SUCH AS MOISTURE CONTENT WHICH HAVE NOT BEEN DETERMINED. THEY ARE THEREFORE INDICATIVE ONLY AND SHOULD BE VERIFIED BY TEST OR OBSERVATION

Depth (m)	Blows/ 100mm	Inferred Consistency	Shear Strength	CBR %
0				
0.1	3	Loose	<30 deg	5
0.2	6	Med.Dense	33 deg	10
0.3	11	Dense	36 deg	19
0.4	13	Dense	37 deg	23
0.5	15	Dense	37 deg	27
0.6	18	Dense	37 deg	33
	Refusal			



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GEOSURE (Pty) Ltd

Client: Escongweni BPH Engineers (Pty) Ltd **Ref.No.** 085-20

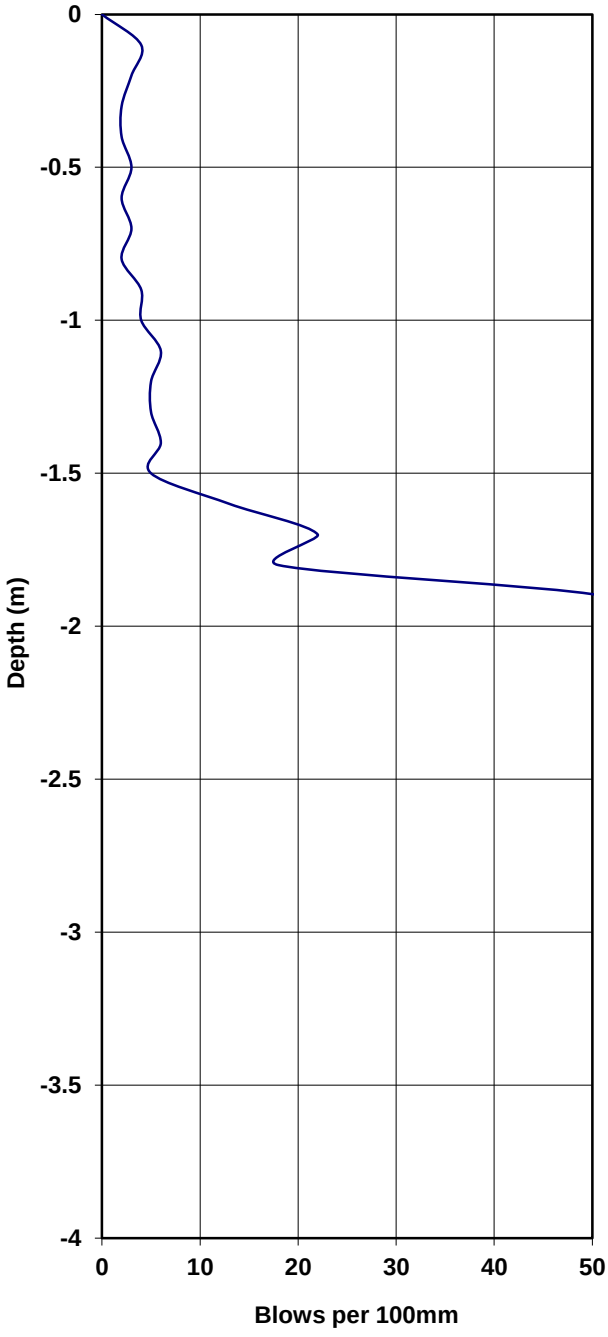
Project: Proposed Water Supply Scheme at Mpolweni **Date:** 15.05.2020

Section: Umgungundlovu District Municipality **Operator:** E.Dada-Mia

CBR Penetrometer Probe ---------- Test No. DC 50

THE STRENGTH AND CBR VALUES ARE EMPIRICAL AND DEPEND ON FACTORS SUCH AS MOISTURE CONTENT WHICH HAVE NOT BEEN DETERMINED. THEY ARE THEREFORE INDICATIVE ONLY AND SHOULD BE VERIFIED BY TEST OR OBSERVATION

Depth (m)	Blows/ 100mm	Inferred Consistency	Shear Strength	CBR %
0				
0.1	4	Med.Dense	30 deg	7
0.2	3	Loose	<30 deg	5
0.3	2	Loose	<30 deg	3
0.4	2	Loose	<30 deg	3
0.5	3	Loose	<30 deg	5
0.6	2	Loose	<30 deg	3
0.7	3	Loose	<30 deg	5
0.8	2	Loose	<30 deg	3
0.9	4	Med.Dense	30 deg	7
1	4	Med.Dense	30 deg	7
1.1	6	Med.Dense	33 deg	10
1.2	5	Med.Dense	32 deg	8
1.3	5	Med.Dense	32 deg	8
1.4	6	Med.Dense	33 deg	10
1.5	5	Med.Dense	32 deg	8
1.6	13	Dense	37 deg	23
1.7	22	Dense	38 deg	42
1.8	18	Dense	37 deg	33
	Refusal			



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GEOSURE (Pty) Ltd

Client: Escongweni BPH Engineers (Pty) Ltd **Ref.No.** 085-20

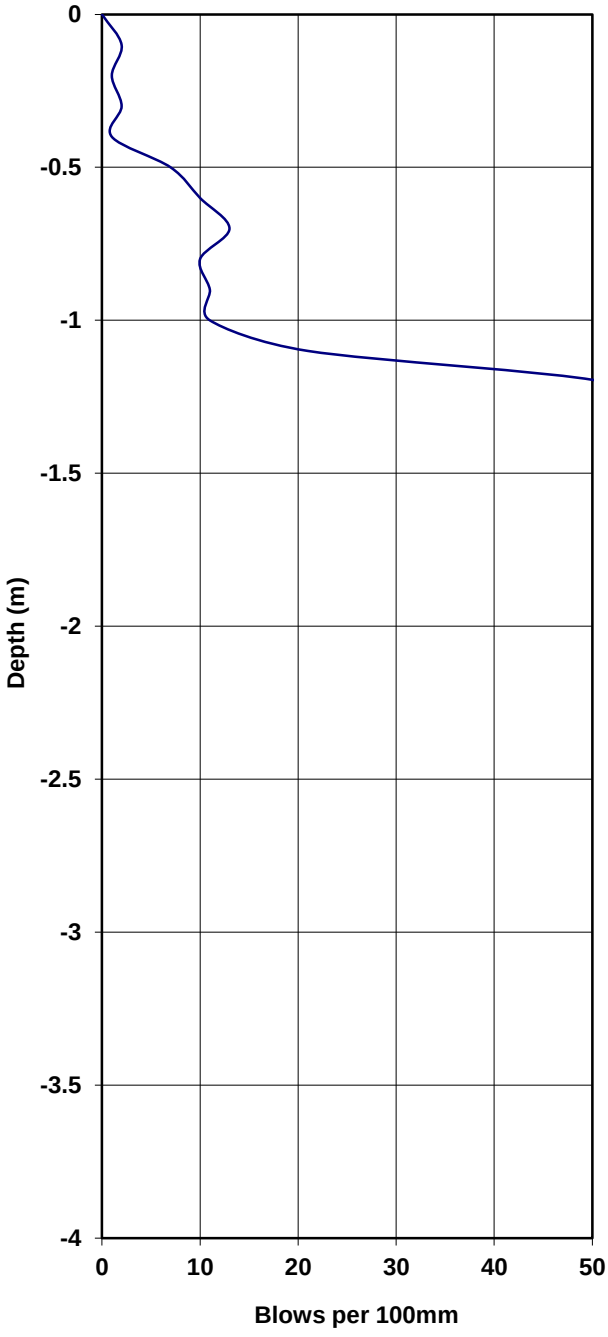
Project: Proposed Water Supply Scheme at Mpolweni **Date:** 15.05.2020

Section: Umgungundlovu District Municipality **Operator:** E.Dada-Mia

CBR Penetrometer Probe ---------- Test No. DC 51

THE STRENGTH AND CBR VALUES ARE EMPIRICAL AND DEPEND ON FACTORS SUCH AS MOISTURE CONTENT WHICH HAVE NOT BEEN DETERMINED. THEY ARE THEREFORE INDICATIVE ONLY AND SHOULD BE VERIFIED BY TEST OR OBSERVATION

Depth (m)	Blows/ 100mm	Inferred Consistency	Shear Strength	CBR %
0				
0.1	2	Loose	<30 deg	3
0.2	1	Very Loose	<29 deg	2
0.3	2	Loose	<30 deg	3
0.4	1	Very Loose	<29 deg	2
0.5	7	Med.Dense	34 deg	12
0.6	10	Med.Dense	36 deg	17
0.7	13	Dense	37 deg	23
0.8	10	Med.Dense	36 deg	17
0.9	11	Dense	36 deg	19
1	11	Dense	36 deg	19
1.1	21	Dense	38 deg	40
	Refusal			



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Client: Escongweni BPH Engineers (Pty) Ltd **Ref.No.** 085-20

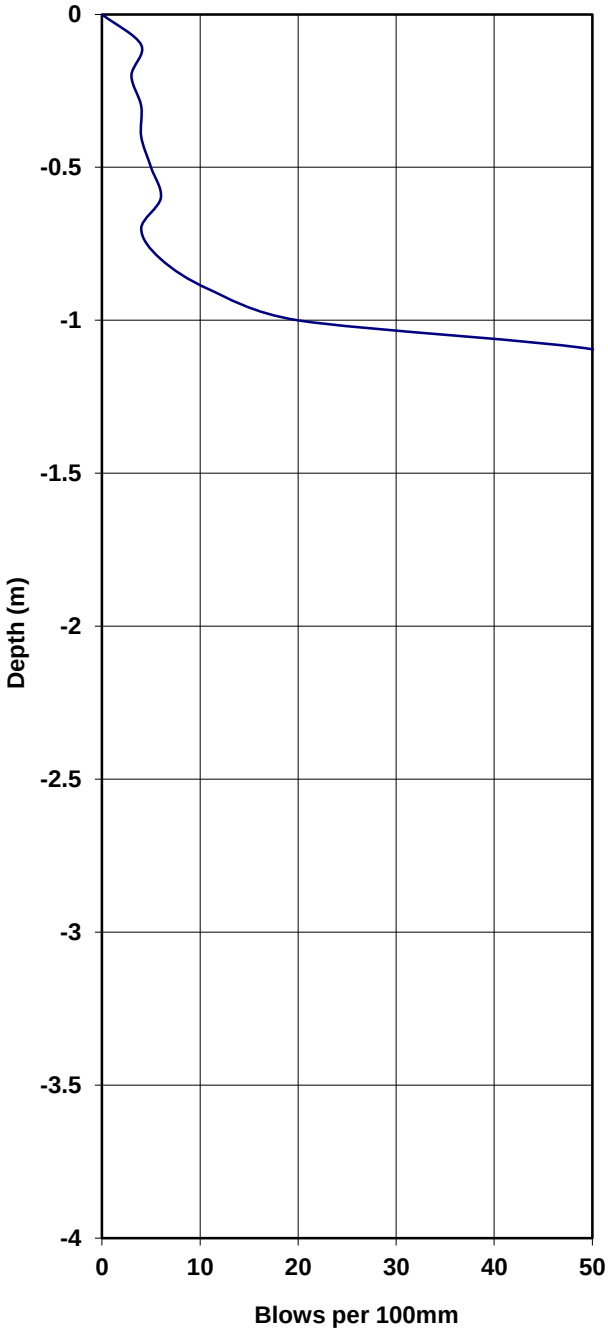
Project: Proposed Water Supply Scheme at Mpolweni **Date:** 15.05.2020

Section: Umgungundlovu District Municipality **Operator:** E.Dada-Mia

CBR Penetrometer Probe ---------- Test No. DC 52

THE STRENGTH AND CBR VALUES ARE EMPIRICAL AND DEPEND ON FACTORS SUCH AS MOISTURE CONTENT WHICH HAVE NOT BEEN DETERMINED. THEY ARE THEREFORE INDICATIVE ONLY AND SHOULD BE VERIFIED BY TEST OR OBSERVATION

Depth (m)	Blows/ 100mm	Inferred Consistency	Shear Strength	CBR %
0				
0.1	4	Med.Dense	30 deg	7
0.2	3	Loose	<30 deg	5
0.3	4	Med.Dense	30 deg	7
0.4	4	Med.Dense	30 deg	7
0.5	5	Med.Dense	32 deg	8
0.6	6	Med.Dense	33 deg	10
0.7	4	Med.Dense	30 deg	7
0.8	6	Med.Dense	33 deg	10
0.9	11	Dense	36 deg	19
1	20	Dense	38 deg	37
	Refusal			



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GEOSURE (Pty) Ltd

Client: Escongweni BPH Engineers (Pty) Ltd **Ref.No.** 085-20

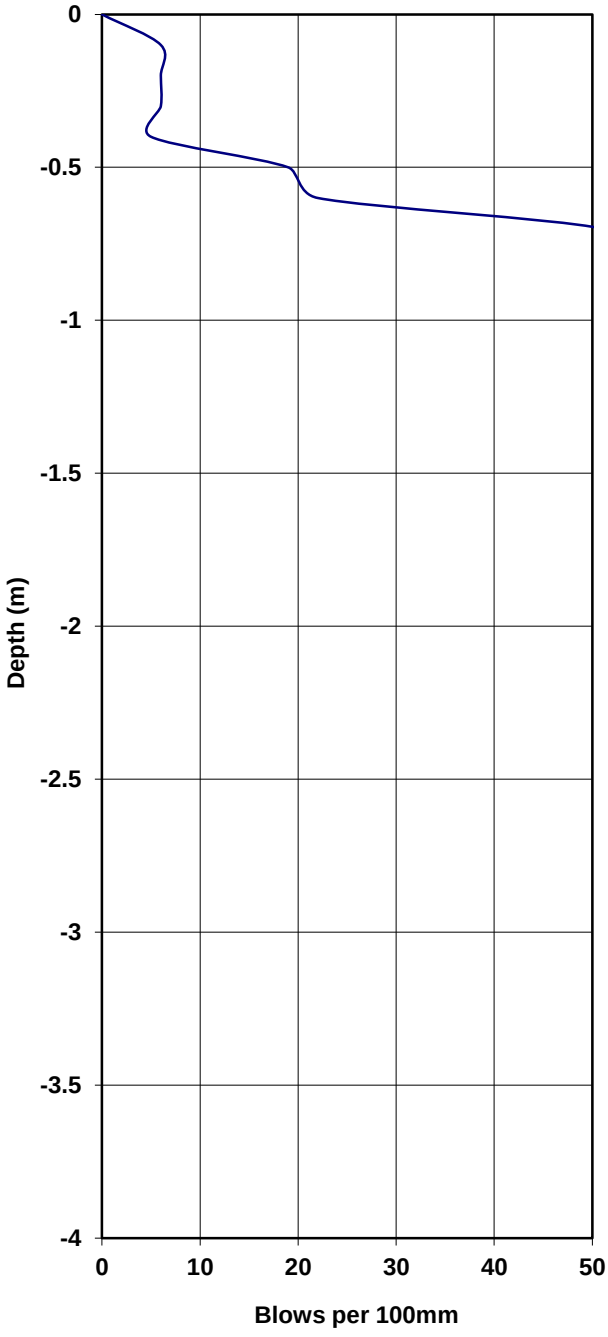
Project: Proposed Water Supply Scheme at Mpolweni **Date:** 15.05.2020

Section: Umgungundlovu District Municipality **Operator:** E.Dada-Mia

CBR Penetrometer Probe ---------- Test No. DC 53

THE STRENGTH AND CBR VALUES ARE EMPIRICAL AND DEPEND ON FACTORS SUCH AS MOISTURE CONTENT WHICH HAVE NOT BEEN DETERMINED. THEY ARE THEREFORE INDICATIVE ONLY AND SHOULD BE VERIFIED BY TEST OR OBSERVATION

Depth (m)	Blows/ 100mm	Inferred Consistency	Shear Strength	CBR %
0				
0.1	6	Med.Dense	33 deg	10
0.2	6	Med.Dense	33 deg	10
0.3	6	Med.Dense	33 deg	10
0.4	5	Med.Dense	32 deg	8
0.5	19	Dense	37 deg	35
0.6	22	Dense	38 deg	42
	Refusal			



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GEOSURE (Pty) Ltd

Client: Escongweni BPH Engineers (Pty) Ltd **Ref.No.** 085-20

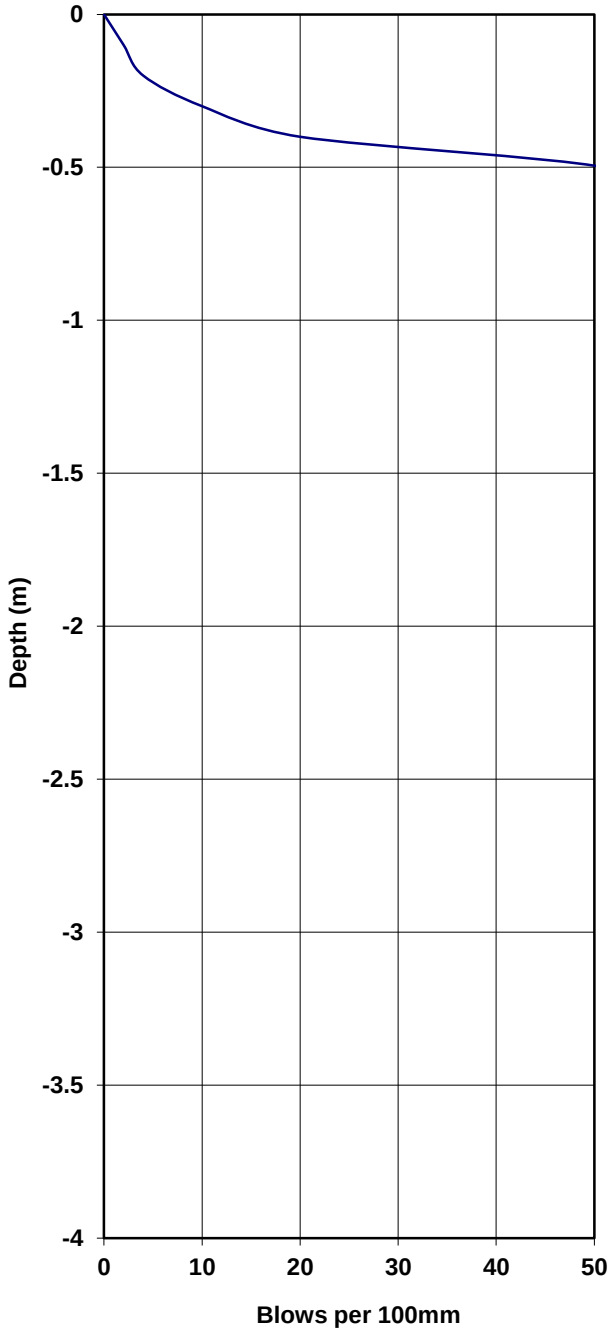
Project: Proposed Water Supply Scheme at Mpolweni **Date:** 15.05.2020

Section: Umgungundlovu District Municipality **Operator:** E.Dada-Mia

CBR Penetrometer Probe ---------- Test No. DC 54

THE STRENGTH AND CBR VALUES ARE EMPIRICAL AND DEPEND ON FACTORS SUCH AS MOISTURE CONTENT WHICH HAVE NOT BEEN DETERMINED. THEY ARE THEREFORE INDICATIVE ONLY AND SHOULD BE VERIFIED BY TEST OR OBSERVATION

Depth (m)	Blows/ 100mm	Inferred Consistency	Shear Strength	CBR %
0				
0.1	2	Loose	<30 deg	3
0.2	4	Med.Dense	30 deg	7
0.3	10	Med.Dense	36 deg	17
0.4	20	Dense	38 deg	37
	Refusal			



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GEOSURE (Pty) Ltd

Client: Escongweni BPH Engineers (Pty) Ltd **Ref.No.** 085-20

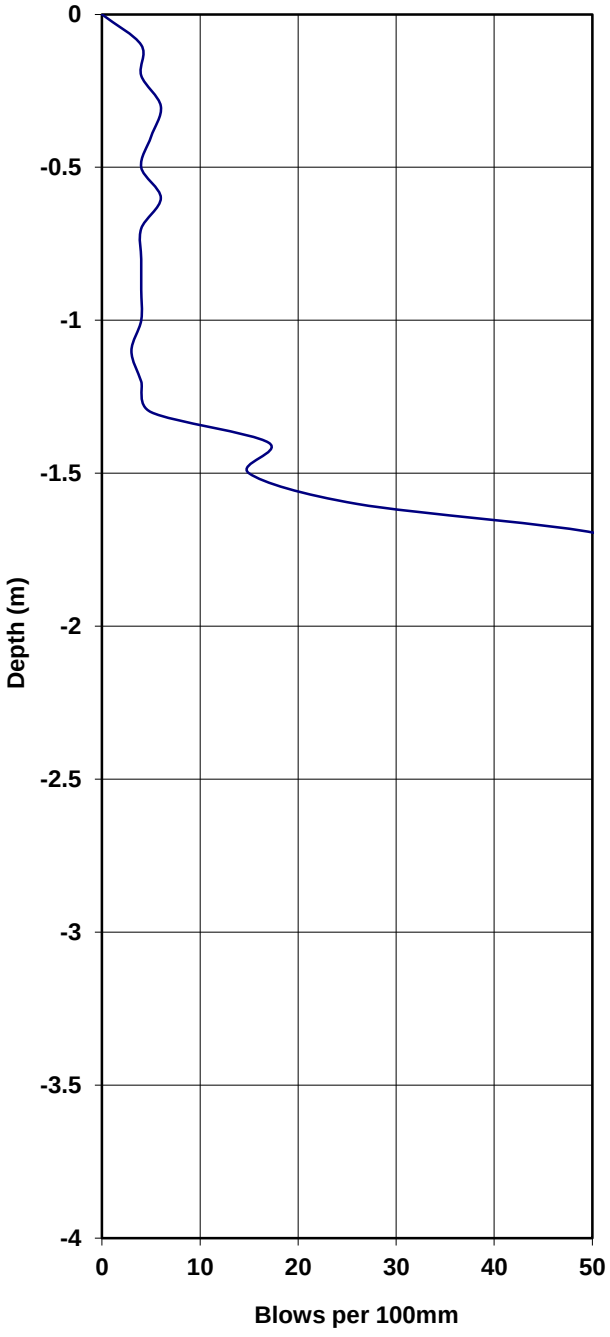
Project: Proposed Water Supply Scheme at Mpolweni **Date:** 15.05.2020

Section: Umgungundlovu District Municipality **Operator:** E.Dada-Mia

CBR Penetrometer Probe ---------- Test No. DC 55

THE STRENGTH AND CBR VALUES ARE EMPIRICAL AND DEPEND ON FACTORS SUCH AS MOISTURE CONTENT WHICH HAVE NOT BEEN DETERMINED. THEY ARE THEREFORE INDICATIVE ONLY AND SHOULD BE VERIFIED BY TEST OR OBSERVATION

Depth (m)	Blows/ 100mm	Inferred Consistency	Shear Strength	CBR %
0				
0.1	4	Med.Dense	30 deg	7
0.2	4	Med.Dense	30 deg	7
0.3	6	Med.Dense	33 deg	10
0.4	5	Med.Dense	32 deg	8
0.5	4	Med.Dense	30 deg	7
0.6	6	Med.Dense	33 deg	10
0.7	4	Med.Dense	30 deg	7
0.8	4	Med.Dense	30 deg	7
0.9	4	Med.Dense	30 deg	7
1	4	Med.Dense	30 deg	7
1.1	3	Loose	<30 deg	5
1.2	4	Med.Dense	30 deg	7
1.3	5	Med.Dense	32 deg	8
1.4	17	Dense	37 deg	31
1.5	15	Dense	37 deg	27
1.6	26	Very Dense	>38 deg	51
	Refusal			



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GEOSURE (Pty) Ltd

Client: Escongweni BPH Engineers (Pty) Ltd **Ref.No.** 085-20

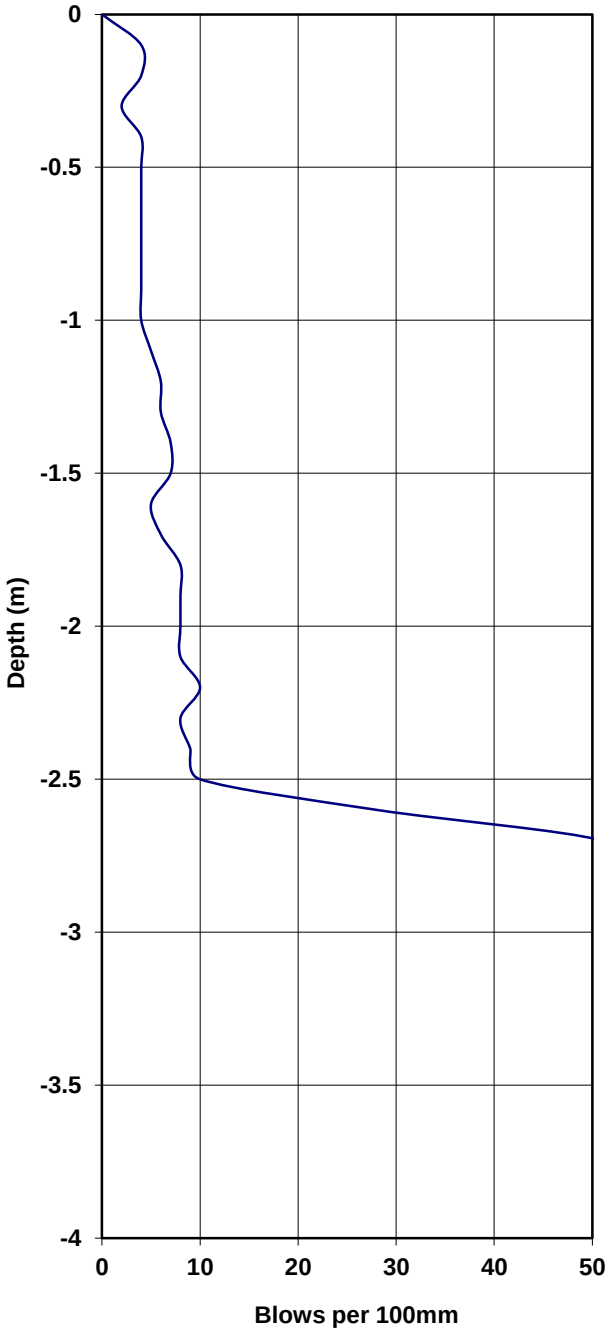
Project: Proposed Water Supply Scheme at Mpolweni **Date:** 15.05.2020

Section: Umgungundlovu District Municipality **Operator:** E.Dada-Mia

CBR Penetrometer Probe ---------- Test No. DC 56

THE STRENGTH AND CBR VALUES ARE EMPIRICAL AND DEPEND ON FACTORS SUCH AS MOISTURE CONTENT WHICH HAVE NOT BEEN DETERMINED. THEY ARE THEREFORE INDICATIVE ONLY AND SHOULD BE VERIFIED BY TEST OR OBSERVATION

Depth (m)	Blows/ 100mm	Inferred Consistency	Shear Strength	CBR %
0				
0.1	4	Med.Dense	30 deg	7
0.2	4	Med.Dense	30 deg	7
0.3	2	Loose	<30 deg	3
0.4	4	Med.Dense	30 deg	7
0.5	4	Med.Dense	30 deg	7
0.6	4	Med.Dense	30 deg	7
0.7	4	Med.Dense	30 deg	7
0.8	4	Med.Dense	30 deg	7
0.9	4	Med.Dense	30 deg	7
1	4	Med.Dense	30 deg	7
1.1	5	Med.Dense	32 deg	8
1.2	6	Med.Dense	33 deg	10
1.3	6	Med.Dense	33 deg	10
1.4	7	Med.Dense	34 deg	12
1.5	7	Med.Dense	34 deg	12
1.6	5	Med.Dense	32 deg	8
1.7	6	Med.Dense	33 deg	10
1.8	8	Med.Dense	35 deg	14
1.9	8	Med.Dense	35 deg	14
2	8	Med.Dense	35 deg	14
2.1	8	Med.Dense	35 deg	14
2.2	10	Med.Dense	36 deg	17
2.3	8	Med.Dense	35 deg	14
2.4	9	Med.Dense	35 deg	15
2.5	10	Med.Dense	36 deg	17
2.6	28	Very Dense	>38 deg	>55
	Refusal			



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GEOSURE (Pty) Ltd

Client: Escongweni BPH Engineers (Pty) Ltd **Ref.No.** 085-20

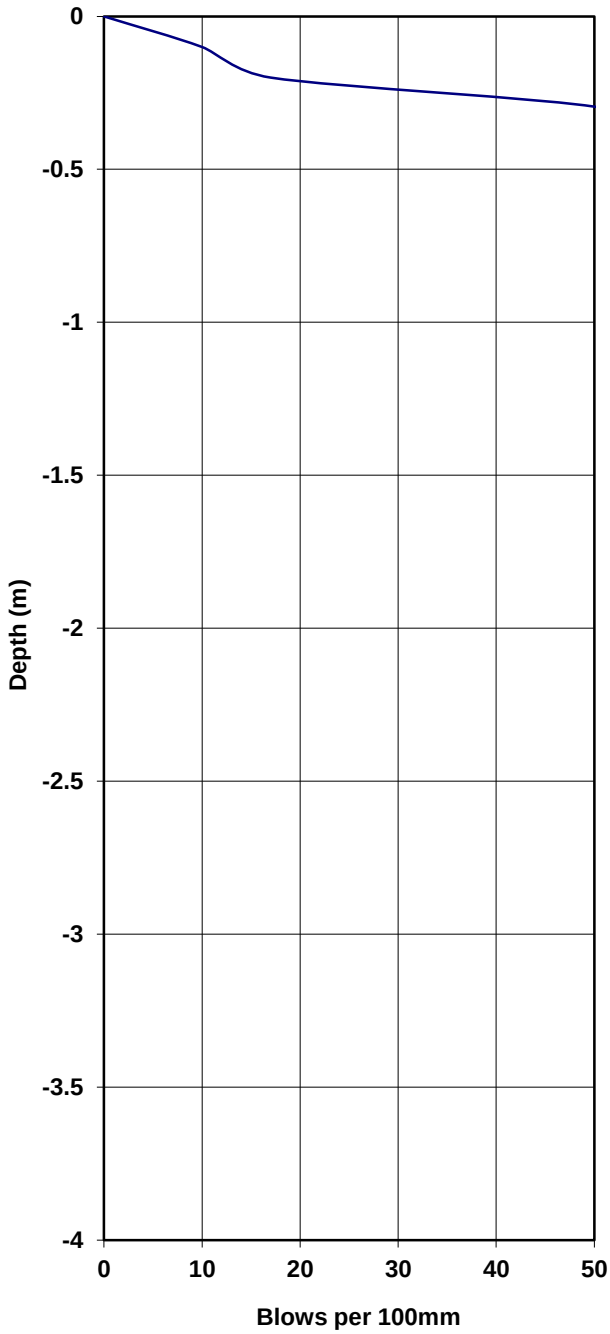
Project: Proposed Water Supply Scheme at Mpolweni **Date:** 15.05.2020

Section: Umgungundlovu District Municipality **Operator:** E.Dada-Mia

CBR Penetrometer Probe ---------- Test No. DC 57

THE STRENGTH AND CBR VALUES ARE EMPIRICAL AND DEPEND ON FACTORS SUCH AS MOISTURE CONTENT WHICH HAVE NOT BEEN DETERMINED. THEY ARE THEREFORE INDICATIVE ONLY AND SHOULD BE VERIFIED BY TEST OR OBSERVATION

Depth (m)	Blows/ 100mm	Inferred Consistency	Shear Strength	CBR %
0				
0.1	10	Med.Dense	36 deg	17
0.2	17	Dense	37 deg	31
	Refusal			



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Consulting Engineering Geologists, Geotechnical Engineers, Geotechnicians & Geotechnical Quality Assurance Specialists

GEOSURE (Pty) Ltd

Client: Escongweni BPH Engineers (Pty) Ltd **Ref.No.** 085-20

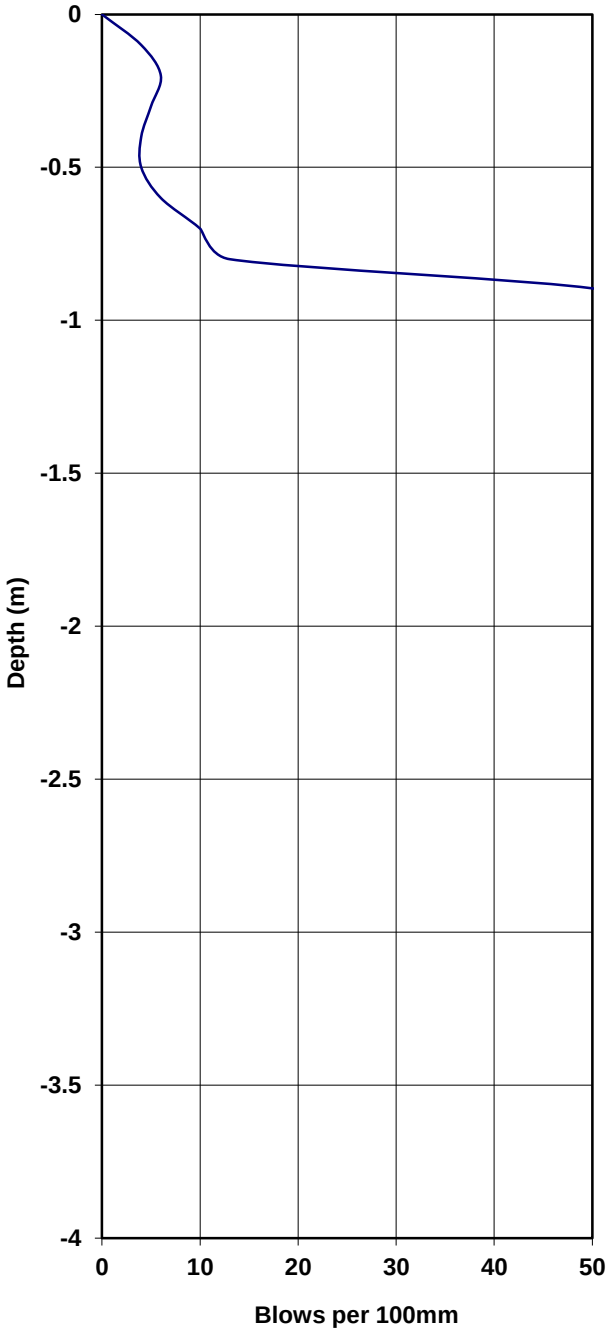
Project: Proposed Water Supply Scheme at Mpolweni **Date:** 15.05.2020

Section: Umgungundlovu District Municipality **Operator:** E.Dada-Mia

CBR Penetrometer Probe ---------- Test No. DC 58

THE STRENGTH AND CBR VALUES ARE EMPIRICAL AND DEPEND ON FACTORS SUCH AS MOISTURE CONTENT WHICH HAVE NOT BEEN DETERMINED. THEY ARE THEREFORE INDICATIVE ONLY AND SHOULD BE VERIFIED BY TEST OR OBSERVATION

Depth (m)	Blows/ 100mm	Inferred Consistency	Shear Strength	CBR %
0				
0.1	4	Med.Dense	30 deg	7
0.2	6	Med.Dense	33 deg	10
0.3	5	Med.Dense	32 deg	8
0.4	4	Med.Dense	30 deg	7
0.5	4	Med.Dense	30 deg	7
0.6	6	Med.Dense	33 deg	10
0.7	10	Med.Dense	36 deg	17
0.8	13	Dense	37 deg	23
	Refusal			



APPENDIX C

DYNAMIC CONE PENETROMETER – LIGHT (DPL) TEST RESULTS (3ML RESERVOIR)

GEOSURE (PTY) LTD.

Geotechnical Engineering Consultants

Tel: (031) 266 0458 Fax: 086 689 5506 Email: info@geosure.co.za

Client: Escongweni BPH Engineers (Pty) Ltd
Project: Proposed Water Supply Scheme at Mpolweni
Section: Umgungundlovu District Municipality

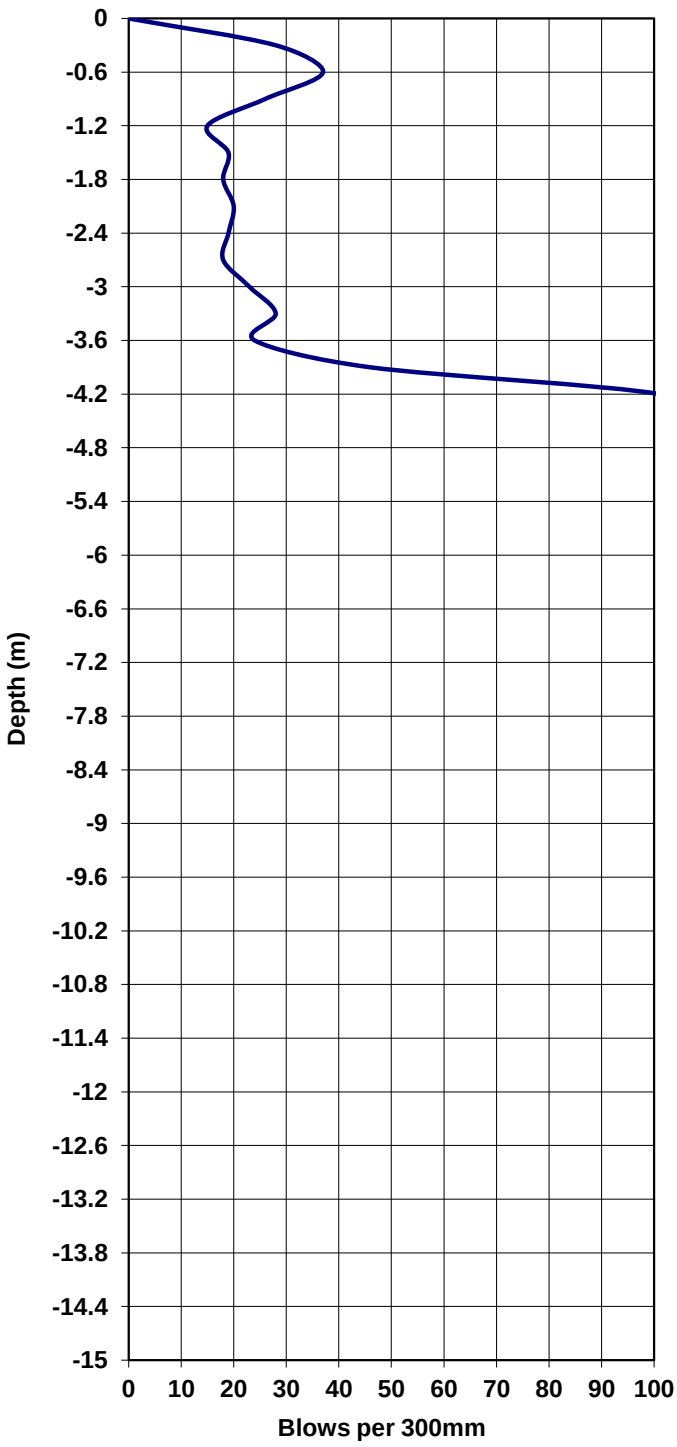
Ref.No. 085-20
Date: 17.05.2020
Operator: E.Dada-Mia

Light Dynamic Penetrometer Probe ---------- ***Test No. DPL 1***

THE INSITU STRENGTH DEPENDS ON SOIL MOISTURE CONTENT AND GRAIN STRUCTURE WHICH HAVE NOT BEEN ASSESSED AND MAY CHANGE. THE VALUES GIVEN ARE THEREFORE INDICATIVE ONLY AND SHOULD BE VERIFIED BY TEST OR OBSERVATION

Hammer: 10kg falling 550mm
Cone: 25mm diameter with 60 degree apex angel
Rods: 16mm diameter, 22mm diameter couplings

Depth metres	Blows per 300mm	Inferred Consistency	Insitu Shear Strength
0			
0.3	28	Med.Dense	34 deg
0.6	37	Med.Dense	35 deg
0.9	26	Med.Dense	34 deg
1.2	15	Loose	<30 deg
1.5	19	Med.Dense	32 deg
1.8	18	Med.Dense	31 deg
2.1	20	Med.Dense	32 deg
2.4	19	Med.Dense	32 deg
2.7	18	Med.Dense	31 deg
3	23	Med.Dense	33 deg
3.3	28	Med.Dense	34 deg
3.6	24	Med.Dense	33 deg
3.9	46	Dense	36 deg
	Refusal		
	Bouncing		



GEOSURE (PTY) LTD.

Geotechnical Engineering Consultants

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Client: Escongweni BPH Engineers (Pty) Ltd
Project: Proposed Water Supply Scheme at Mpolweni
Section: Umgungundlovu District Municipality

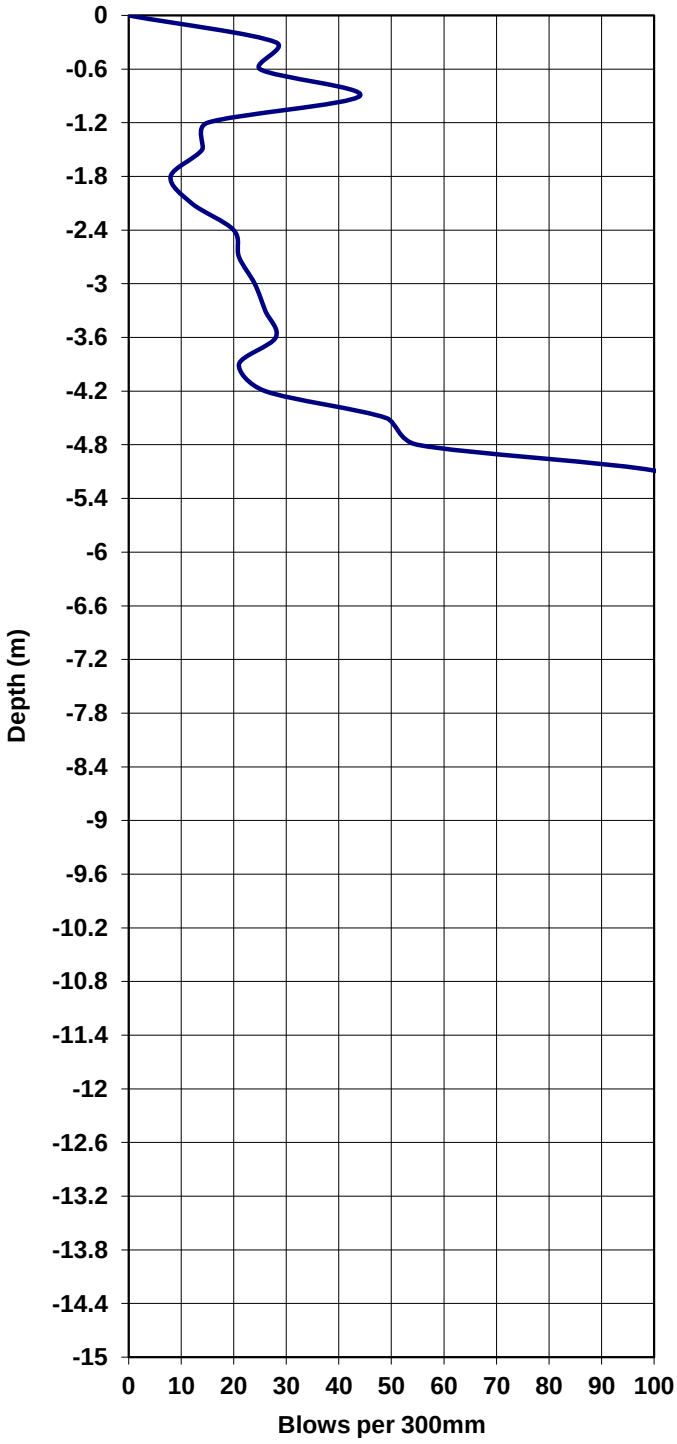
Ref.No. 085-20
Date: 17.05.2020
Operator: E.Dada-Mia

Light Dynamic Penetrometer Probe ---------- ***Test No. DPL 2***

THE INSITU STRENGTH DEPENDS ON SOIL MOISTURE CONTENT AND GRAIN STRUCTURE WHICH HAVE NOT BEEN ASSESSED AND MAY CHANGE. THE VALUES GIVEN ARE THEREFORE INDICATIVE ONLY AND SHOULD BE VERIFIED BY TEST OR OBSERVATION

Hammer: 10kg falling 550mm
Cone: 25mm diameter with 60 degree apex angel
Rods: 16mm diameter, 22mm diameter couplings

Depth metres	Blows per 300mm	Inferred Consistency	Insitu Shear Strength
0			
0.3	28	Med.Dense	34 deg
0.6	25	Med.Dense	33 deg
0.9	44	Dense	36 deg
1.2	15	Loose	<30 deg
1.5	14	Loose	<30 deg
1.8	8	Loose	<30 deg
2.1	12	Loose	<30 deg
2.4	20	Med.Dense	32 deg
2.7	21	Med.Dense	32 deg
3	24	Med.Dense	33 deg
3.3	26	Med.Dense	34 deg
3.6	28	Med.Dense	34 deg
3.9	21	Med.Dense	32 deg
4.2	26	Med.Dense	34 deg
4.5	49	Dense	36 deg
4.8	55	Dense	37 deg
	Refusal		
	Bouncing		



APPENDIX D

RESULTS OF LABORATORY TESTS

Consulting Engineering Geologists, Geotechnical Engineers, Geotechnicians & Geotechnical Quality Assurance Specialists

GEOSURE (Pty) Ltd

sanas Testing Laboratory T0483

CLIENT : Geosure (Pty) Ltd
PHYSICAL ADDRESS : 122 Intersite Avenue, Springfield Park,
Umgeni
Durban, 4001
ATTENTION : Mr D. Naidoo
PROJECT : Proposed Water Supply Scheme at Mpolweni

TEST REPORT REFERENCE NUMBER: 49173-1

Dear Sir/Madam,
Enclosed herewith, please find the original reports pertaining to the above-mentioned project.

Date Received	**25.05.2020**
Date Tested	29.05.2020 to 11.06.2020
Sample Location	Refer to Report
Sampling Method	N/A
Sample Condition	Moist
Sampling Environmental Condition	N/A
Sampler(s) Name	Client
Total Number of Pages	24

Test Carried Out			
SANS3001 GR1	✓	TMH1 Method C3	
SANS3001 GR10, GR12	✓	TMH1 Method C4a	
SANS3001 GR30	✓	TMH1 Method B6	
SANS3001 GR40	✓	Hydrometer Analysis - ASTM D422	✓
TMH1 Method A10(b)		SABS1200 (Compactibility Factor)#	
TMH1 Method A13T + A14app		SANS 5862-1	
TMH1 Method A15d		SANS 5860, 5861-1, 5861-2, 5861-3	
TMH1 Method A13T + A16T		TMH1 Method B9	

✓ - Tick denotes tests that were carried out. #Denotes non accredited tests

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.

Yours faithfully

Technical Signatory,
Dheeran Ramcharan for Geosure (Pty) Ltd.

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PO Box 1461, Westville, 3630, South Africa
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Fax: 086 689 8327
Mobile: 083 377 6559
Email: gauteng@geosure.co.za

Consulting Engineering Geologists, Geotechnical Engineers, Geotechnicians & Geotechnical Quality Assurance Specialists
GEOSURE (Pty) Ltd
sanas Testing Laboratory T0483

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 : **Geosure (Pty) Ltd** **Our Ref.** : **49173-1**

Project : **Proposed Water Supply at Mpolweni** **Your Ref.** : **085-20**

Date Tested : **29.05.2020 to 03.06.2020**

Attention : **Mr D. Naidoo** **Date Reported** : **05.06.2020**

Sample No.			T25100	T25101	T25104	T25105	T25091
Field No.			IP4	IP5	IP14	Lethingcebo (Quarry)	IP20
Position in Field			Layer 3	Layer 1	Layer 2	Layer 1	Layer 2
Depth (m)			0.60-0.90	0.01-0.38	0.74-1.62	0.0-0.5	0.54-1.30
Material Description			Light greyish orange highly weathered very soft rock. SANDSTONE	Medium brownish grey silty SAND. Colluvium	Dark bluish grey stained light rusty brown highly weathered very soft rock. DOLERITE	Light orange brown gravelly silty SAND. Residual Gneiss	Light purplish grey completely to highly weathered very soft rock. SANDSTONE
Sieve Analysis (Wet Preparation) - SANS3001 GR 1 - Percent Passing Sieve Size							
% Passing	**100.0**	**mm**	100	100	100	100	100
	75.0	**mm**	100	100	100	100	100
	63.0	**mm**	100	100	97	100	100
	50.0	**mm**	100	100	97	100	100
	37.5	**mm**	100	100	94	100	100
	28.0	**mm**	100	100	88	100	98
	20.0	**mm**	100	100	80	100	97
	14.0	**mm**	100	99	77	97	96
	5.00	**mm**	96	98	53	72	92
	2.00	**mm**	91	93	44	53	85
	0.425	**mm**	48	66	36	27	40
	0.250	**mm**	30	49	35	20	27
	0.150	**mm**	18	32	33	14	19
	0.075	**mm**	12	20	31	10	13
Hydrometer Analysis - ASTM - D422 - Percent Passing Particle Diameter (<0.425mm)							
% Passing	**0.060**	**mm**	11	18	30	9	12
	0.050	**mm**	11	17	29	8	11
	0.040	**mm**	10	16	28	7	10
	0.026	**mm**	9	14	26	6	9
	0.015	**mm**	8	13	24	5	8
	0.010	**mm**	7	11	23	5	6
	0.0074	**mm**	6	11	21	4	6
	0.0036	**mm**	5	10	19	3	4
	0.0020	**mm**	4	8	17	2	4
	0.0015	**mm**	3	6	17	2	3
Mechanical analysis - SANS3001 GR1 - Percent of Soil Mortar (<2 mm) for Grain Size range							
Coarse Sand		**%**	47	30	18	48	53
Coarse Fine Sand		**%**	20	17	3	13	15
Medium Fine Sand		**%**	13	19	4	11	10
Fine Fine Sand		**%**	6	13	4	8	7
Silt & Clay		**%**	13	21	71	19	15
Grading Modulus			1.49	1.22	1.88	2.09	1.62
Atterberg Limits - SANS3001 GR10, GR12 (<0.425mm)							
Liquid Limit		**%**	NP	SP	44	SP	SP
Plasticity Index		**%**	NP	SP	14	SP	SP
Linear Shrinkage		**%**	0.0	0.5	7.0	0.5	0.5
AASHTO Classification (Group Index)*			A-1-b (0)	A-2-4 (0)	A-2-7 (1)	A-1-b (0)	A-1-b (0)
Unified Classification*			SM	SM	GM	SP-SM	SM
Moisture Content		**%**	3.9	4.0	8.4	4.1	6.3
Remarks:	Date Received: 25.05.2020						
	Sampled by Client.						
	*Opinions expressed herein fall outside the scope of SANAS accreditation.						

Consulting Engineering Geologists, Geotechnical Engineers, Geotechnicians & Geotechnical Quality Assurance Specialists
GEOSURE (Pty) Ltd

sanas T6483

Reg.No.: 92/03145/07

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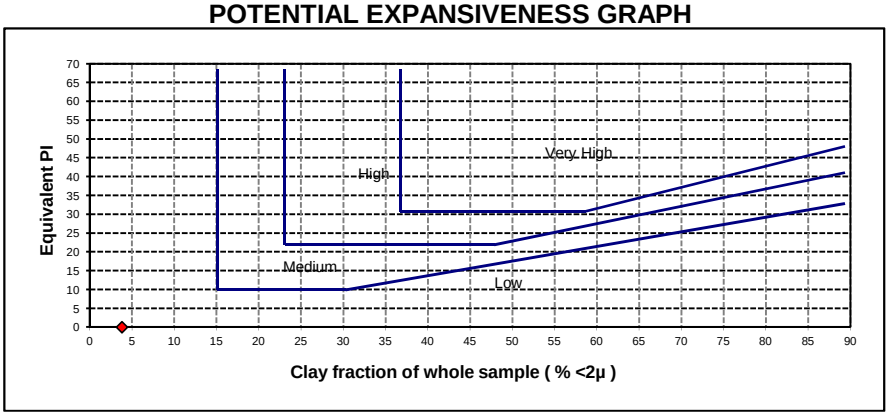
WEBSITE: www.geosure.co.za

Client : Geosure (Pty) Ltd
Project : Proposed Water Supply at Mpolweni
Attention : Mr D. Naidoo

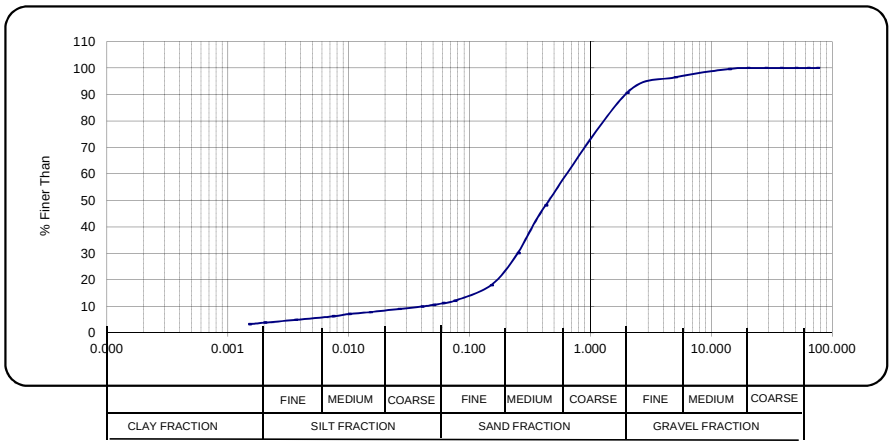
Job No. : 49173-1
Your Ref.No. : 085-20
Date Tested : 29.05.2020 to 03.06.2020
Date Reported : 05.06.2020

Sample Number : T25100
Field No. : IP4
Sample Description : Light greyish orange highly weathered very soft rock. SANDSTONE
Equivalent PI : NP **Clay fraction of whole sample (% <2μ)** : 4

POTENTIAL EXPANSIVENESS GRAPH



PARTICLE SIZE DISTRIBUTION CHART



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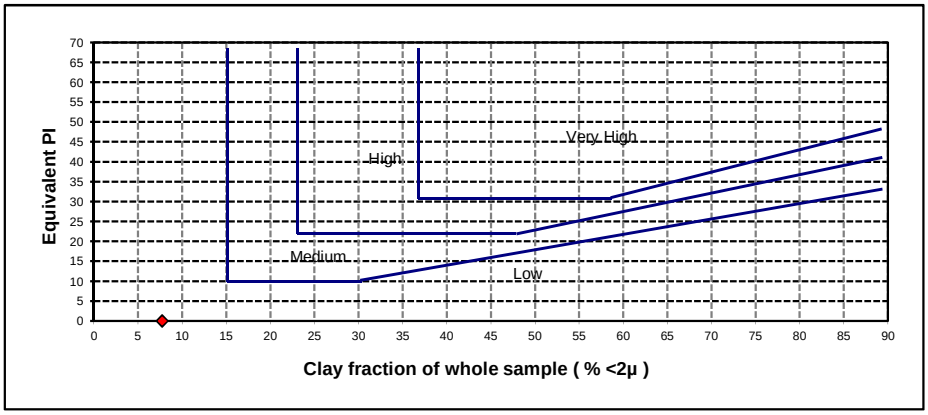
Client : Geosure (Pty) Ltd
Project : Proposed Water Supply at Mpolweni
Attention : Mr D. Naidoo

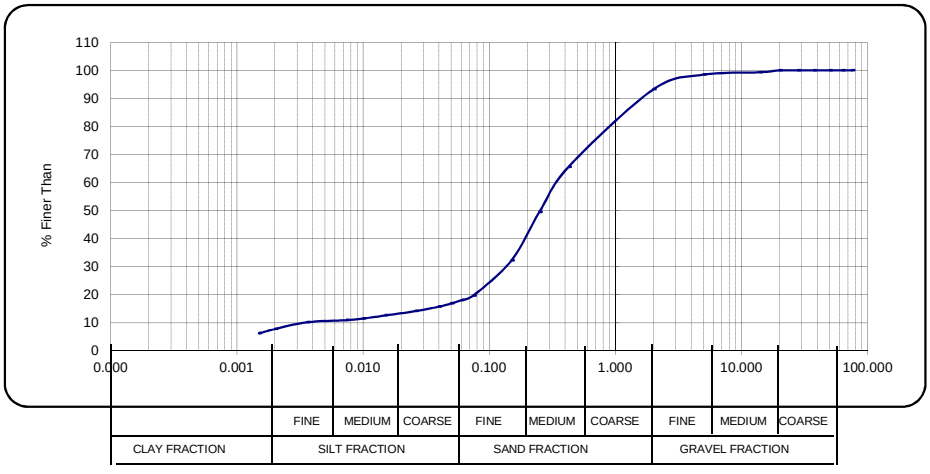
Job No. : 49173-1
Your Ref.No. : 085-20
Date Tested : 29.05.2020 to 03.06.2020
Date Reported : 05.06.2020

Sample Number : T25101
Field No. : IP5
Sample Description : Medium brownish grey silty SAND. Colluvium
Equivalent PI : **Clay fraction of whole sample (% <2μ)** : **8**

POTENTIAL EXPANSIVENESS GRAPH



PARTICLE SIZE DISTRIBUTION CHART



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Client	: Geosure (Pty) Ltd	**Job No.**	: 49173-1
Project	: Proposed Water Supply at Mpolweni	**Your Ref.No.**	: 085-20
		Date Tested	: 29.05.2020 to 03.06.2020
Attention	: Mr D. Naidoo	**Date Reported**	: 05.06.2020

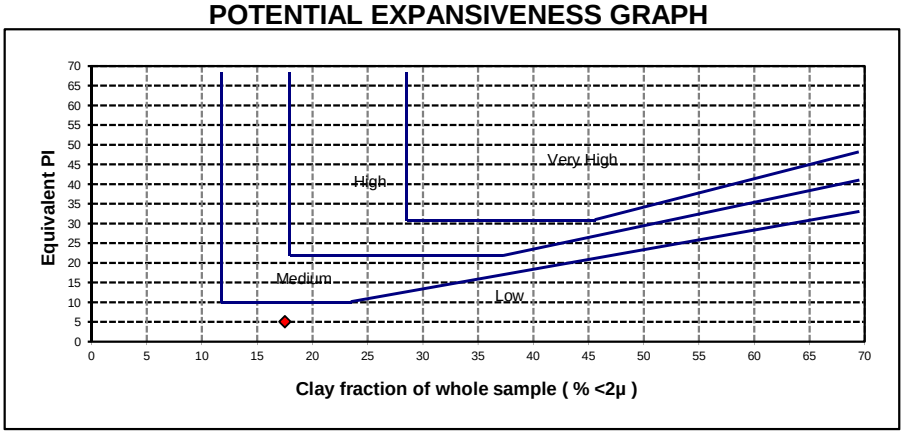
Sample Number : T25104

Field No. : IP14

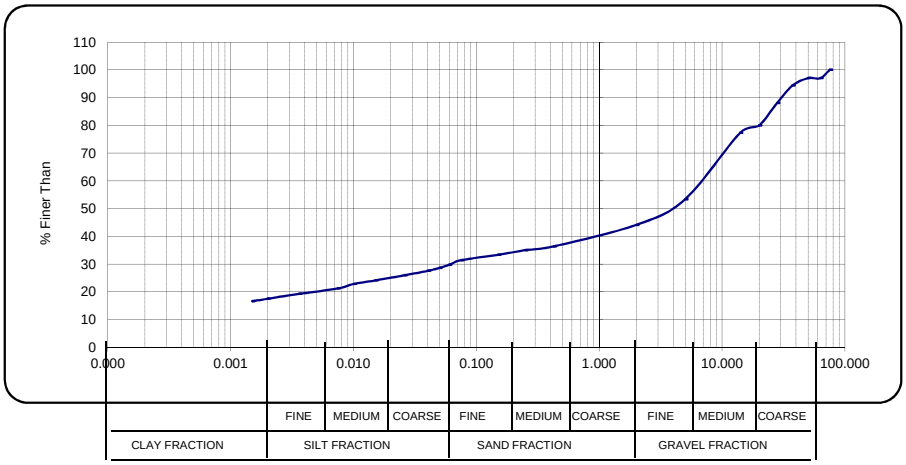
Sample Description : Dark bluish grey stained light rusty brown highly weathered very soft rock. DOLERITE

Equivalent PI : 5 **Clay fraction of whole sample (% <2μ)** : 17

POTENTIAL EXPANSIVENESS GRAPH



PARTICLE SIZE DISTRIBUTION CHART



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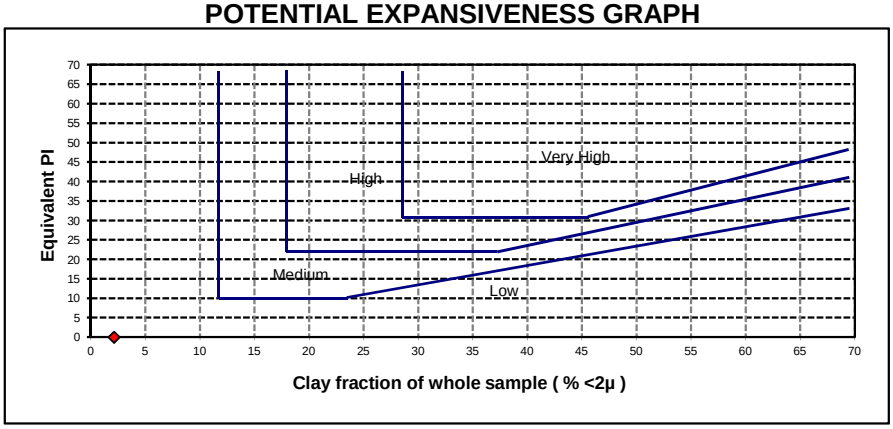
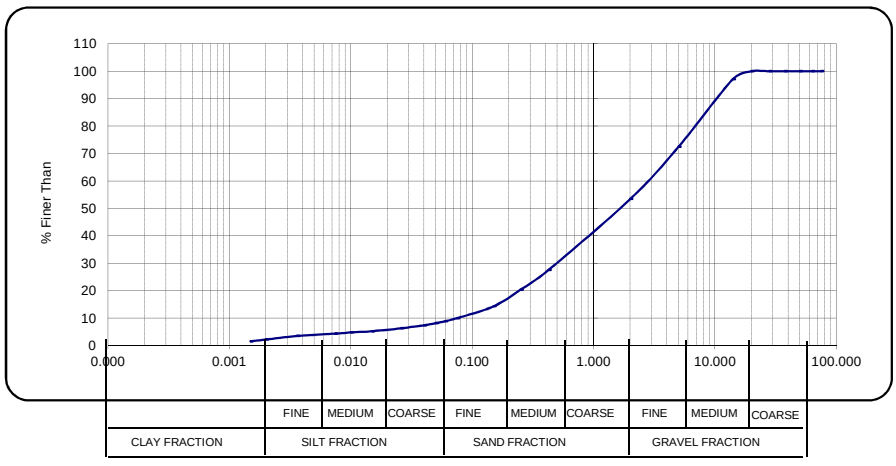
Client	: Geosure (Pty) Ltd	**Job No.**	: 49173-1
Project	: Proposed Water Supply at Mpolweni	**Your Ref.No.**	: 085-20
		Date Tested	: 29.05.2020 to 03.06.2020
Attention	: Mr D. Naidoo	**Date Reported**	: 05.06.2020

Sample Number : T25105
Field No. : Lethingcebo (Quarry)
Sample Description : Light orange brown gravelly silty SAND. Residual Gneiss
Equivalent PI : [ ] **Clay fraction of whole sample (% <2μ)** : [2]

POTENTIAL EXPANSIVENESS GRAPH



PARTICLE SIZE DISTRIBUTION CHART



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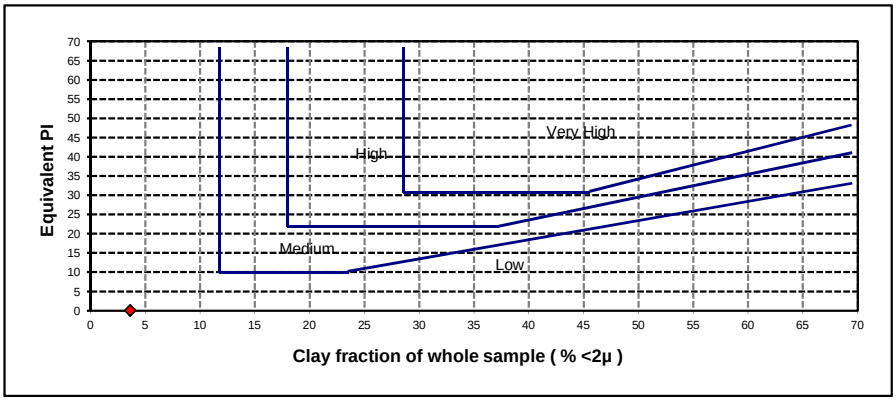
Client : Geosure (Pty) Ltd
Project : Proposed Water Supply at Mpolweni
Attention : Mr D. Naidoo

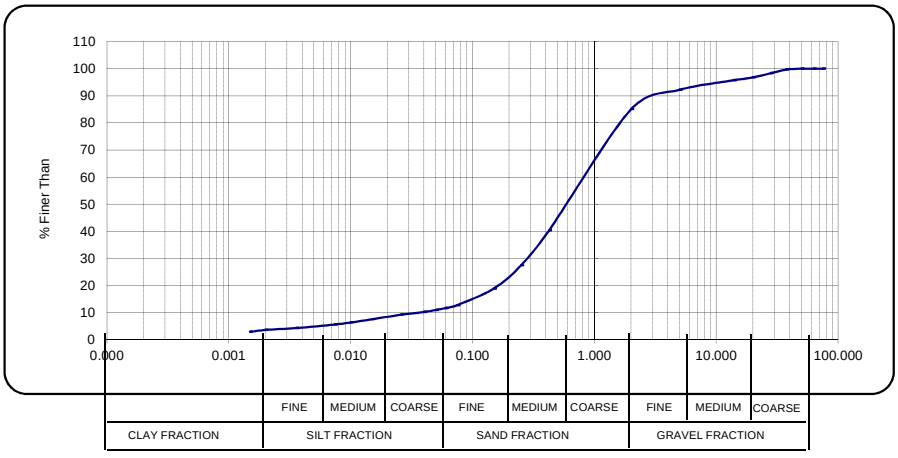
Job No. : 49173-1
Your Ref.No. : 085-20
Date Tested : 29.05.2020 to 03.06.2020
Date Reported : 05.06.2020

Sample Number : T25091
Field No. : IP20
Sample Description : Light purplish grey completely to highly weathered very soft rock. SANDSTONE
Equivalent PI : **Clay fraction of whole sample (% <2μ)** : **4**

POTENTIAL EXPANSIVENESS GRAPH



PARTICLE SIZE DISTRIBUTION CHART



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WEBSITE: www.geosure.co.za

Client : **Geosure (Pty) Ltd** **Our Ref.** : **49173-1**

Project : **Proposed Water Supply at Mpolweni** **Your Ref.** : **085-20**

Date Tested : **29.05.2020 to 03.06.2020**

Attention : **Mr D. Naidoo** **Date Reported** : **05.06.2020**

Sample No.			T25095				
Field No.			IP39				
Position in Field			Layer 2				
Depth (m)			0.24-1.00				
Material Description			Dark bluish grey stained rusty brown and light yellow highly weathered very soft rock. DOLERITE				
Sieve Analysis (Wet Preparation) - SANS3001 GR 1 - Percent Passing Sieve Size							
% Passing	**100.0**	**mm**	100				
	75.0	**mm**	91				
	63.0	**mm**	82				
	50.0	**mm**	77				
	37.5	**mm**	70				
	28.0	**mm**	63				
	20.0	**mm**	53				
	14.0	**mm**	49				
	5.00	**mm**	33				
	2.00	**mm**	26				
	0.425	**mm**	19				
	0.250	**mm**	17				
	0.150	**mm**	15				
	0.075	**mm**	13				
Hydrometer Analysis - ASTM - D422 - Percent Passing Particle Diameter (<0.425mm)							
% Passing	**0.060**	**mm**	12				
	0.050	**mm**	11				
	0.040	**mm**	10				
	0.026	**mm**	9				
	0.015	**mm**	8				
	0.010	**mm**	7				
	0.0074	**mm**	7				
	0.0036	**mm**	6				
	0.0020	**mm**	5				
	0.0015	**mm**	5				
Mechanical analysis - SANS3001 GR1 - Percent of Soil Mortar (<2 mm) for Grain Size range							
Coarse Sand		**%**	27				
Coarse Fine Sand		**%**	7				
Medium Fine Sand		**%**	8				
Fine Fine Sand		**%**	9				
Silt & Clay		**%**	50				
Grading Modulus			2.42				
Atterberg Limits - SANS3001 GR10, GR12 (<0.425mm)							
Liquid Limit		**%**	31				
Plasticity Index		**%**	12				
Linear Shrinkage		**%**	7.0				
AASHTO Classification (Group Index)*			A-2-6 (0)				
Unified Classification*			GC				
Moisture Content		**%**	9.7				

Remarks: Date Received: 25.05.2020

Sampled by Client.

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

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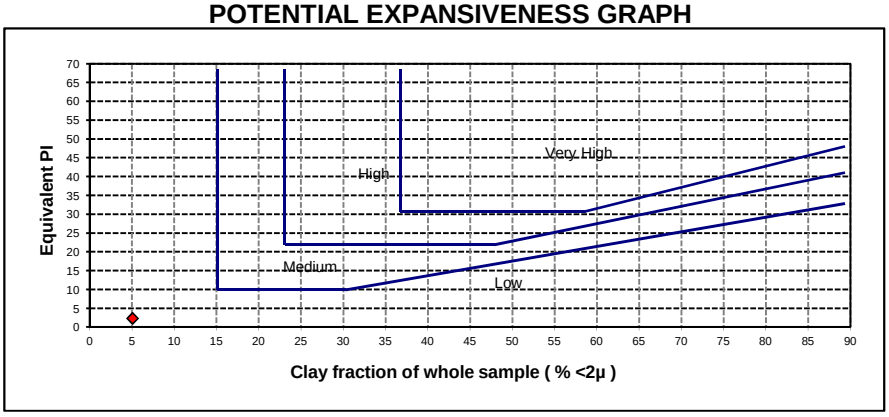
Client : Geosure (Pty) Ltd
Project : Proposed Water Supply at Mpolweni
Attention : Mr D. Naidoo

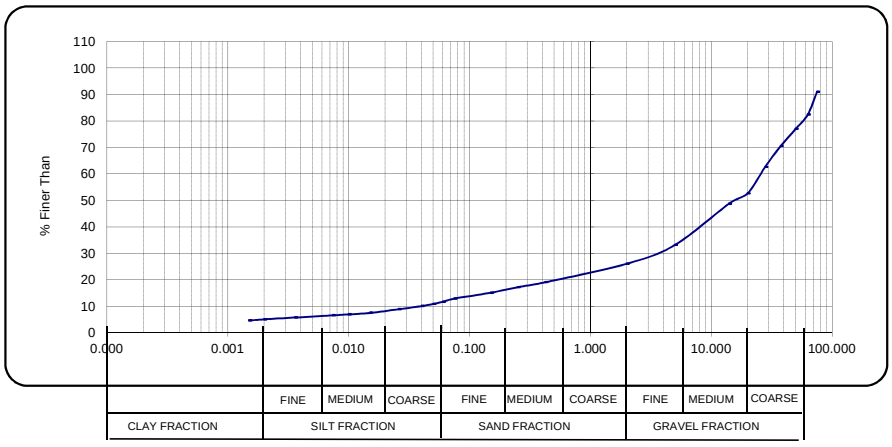
Job No. : 49173-1
Your Ref.No. : 085-20
Date Tested : 29.05.2020 to 03.06.2020
Date Reported : 05.06.2020

Sample Number : T25095
Field No. : IP39
Sample Description : Dark bluish grey stained rusty brown and light yellow highly weathered very soft rock. DOLERITE
Equivalent PI : 2 **Clay fraction of whole sample (% <2μ)** : 5

POTENTIAL EXPANSIVENESS GRAPH



PARTICLE SIZE DISTRIBUTION CHART



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GEOSURE (Pty) Ltd

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

Client : **Geosure (Pty) Ltd** — **Your Ref No. : 085-20**
Project : **Proposed Water Supply Scheme at Mpolweni** — **Our Ref No. : 49173-1**
Attention : **Mr D. Naidoo** — **Date Reported : 10/06/2020**

Test Report - SANS 3001

Sample No.	T25100	T25101	T25104	T25105	T25091
Field No.	IP4	IP5	IP14	Lethingcebo	IP20
Position	Layer 3	Layer 1	Layer 2	Layer 1	Layer 2
Depth (m)	0.60-0.90	0.01-0.38	0.74-1.62	0.0-0.5	0.54-1.30
Method of Preparation	Scalped	N/A	Scalped	N/A	N/A
				Quarry	
Material Description	Light greyish orange highly weathered very soft rock. SANDSTONE	Medium brownish grey silty SAND. Colluvium	Dark bluish grey stained light rusty brown highly weathered very soft rock. DOLERITE	Light orange brown gravelly silty SAND. Residual Gneiss	Light purplish grey completely to highly weathered very soft rock. SANDSTONE

Sieve Analysis - Percent Passing Sieve Size						
Sieve Aperture (mm)	**100.00**					
	75.00			100		
	63.00			97		
	53.00			97		
	50.00			97		
	37.50			94		100
	28.00			88		98
	26.50			88		98
	20.00			80		97
	19.00		100	80	100	97
	14.00		99	77	97	96
	13.20	100	99	77	97	96
	5.00	96	98	53	72	92
	4.750	96	98	53	72	92
	2.000	91	93	44	53	85
	0.425	48	66	36	27	40
	0.075	12	20	31	10	13
Grading Modulus		1.49	1.22	1.88	2.09	1.62
Mechanical analysis - Percent of Soil Mortar (<2 mm) for Grain Size range						
Coarse Sand	**2.000 - 0.425**	47	30	18	48	53
Coarse-Fine Sand	**0.425 - 0.250**	20	17	3	13	15
Medium-Fine Sand	**0.250 - 0.150**	13	19	4	11	10
Fine-Fine Sand	**0.150 - 0.075**	6	13	4	8	7
Silt and Clay	**< 0.075**	13	21	71	19	15
Atterberg Limits SANS 3001 on <0.425 mm fraction						
Liquid Limit	% or symbol	NP	SP	44	SP	SP
Plasticity Index	% or symbol	NP	SP	14	SP	SP
Linear Shrinkage	%	0.0	0.5	7.0	1.0	0.5
Maximum Dry Density and Optimum Moisture Content						
Maximum Dry Density (kg/m³)		2008	2061	1979	2147	1995
Optimum moisture content (%)		8.0	7.5	9.0	7.5	6.4
California Bearing Ratio						
CBR @100% Compaction	%	66	79	31	66	63
CBR @ 98% Compaction	%	48	54	24	52	46
CBR @ 97% Compaction	%	41	45	21	46	39
CBR @ 95% Compaction	%	30	31	16	37	29
CBR @ 93% Compaction	%	22	21	12	29	21
CBR @ 90% Compaction	%	14	12	8.4	20	13
Swell @100% Compaction	%	0.0	0.1	1.0	0.1	0.1
COLTO Classification (1998)†		G6 (#)	G6 (#)	G8 (#)	G6 (#)	G6 (#)
TRH 14 Classification (1985)		G7	G7	G9	G6	G7
AASHTO Classification (Group Index)		A-1-b (0)	A-2-4 (0)	A-2-7 (1)	A-1-b (0)	A-1-b (0)
Unified Classification		SP-SM	SM	GM	SW-SM	SM

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 accreditatior

Version 5.05 - 14 February 2018

Consulting Engineering Geologists, Geotechnical Engineers, Geotechnicians & Geotechnical Quality Assurance Specialists

GEOSURE (Pty) Ltd

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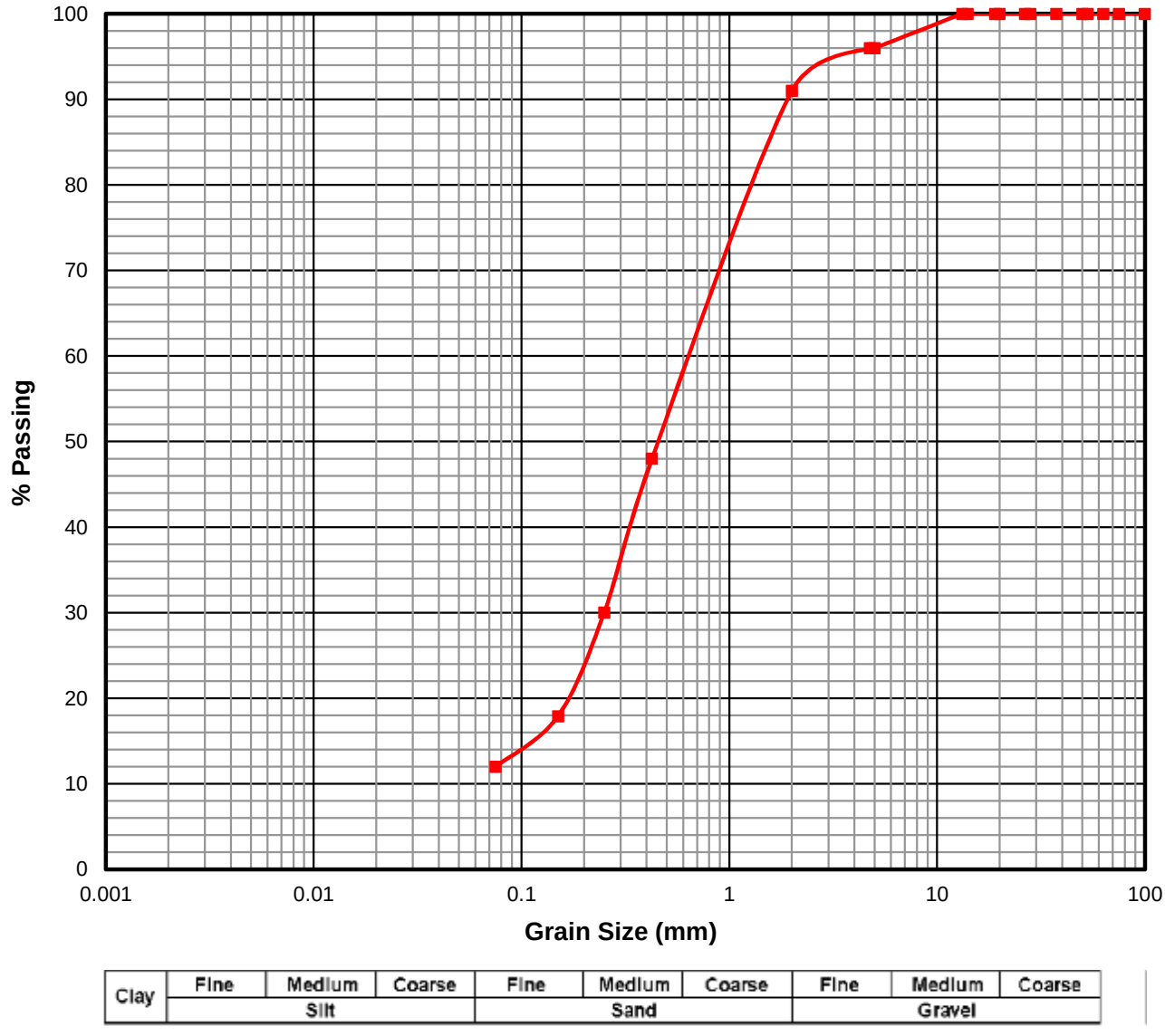
Client : Geosure (Pty) Ltd **Your Ref No.: 085-20**
Project : Proposed Water Supply Scheme at Mpolweni **Our Ref No. : 49173-1**
Attention : Mr D. Naidoo **Date Reported : 10/06/2020**

Grading Curve for Sample T25100 – SANS 3001



Thick Red Line is the Grading Curve (COLTO Classification = G6 (#)) (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	12%	18%	30%	48%	91%	96%	96%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

Consulting Engineering Geologists, Geotechnical Engineers, Geotechnicians & Geotechnical Quality Assurance Specialists
GEOSURE (Pty) Ltd

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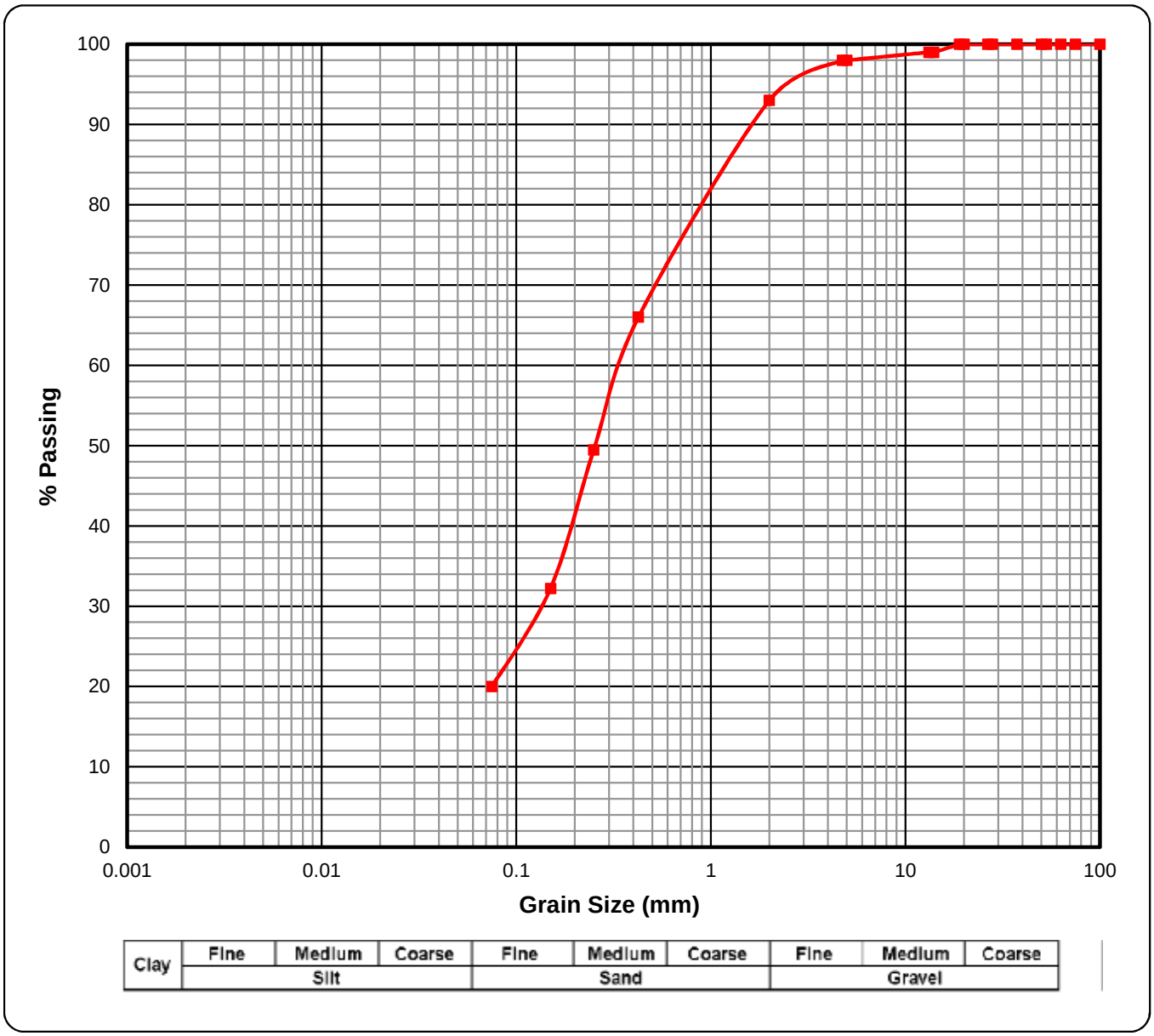
Grading Curve for Sample T25101 – SANS 3001



Thick Red Line is the Grading Curve (COLTO Classification = G6 (#)) (TRH 14 Classification = G7)

Sieve Aperture Size	0.075	0.150	0.015	0.026	0.05	0.06	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	20%	32%	49%	66%	93%	98%	98%	99%	99%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

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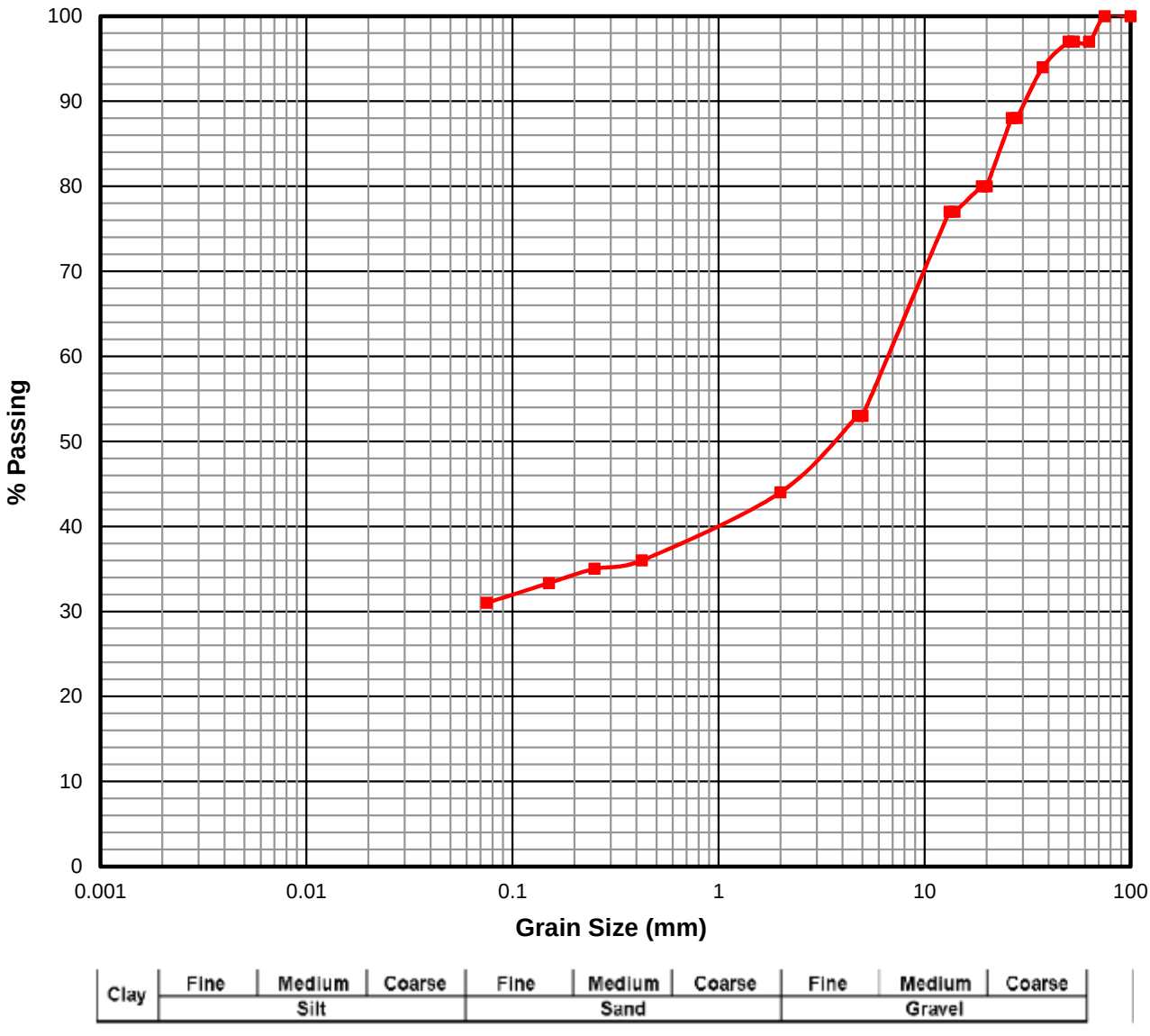
Grading Curve for Sample T25104 – SANS 3001



Thick Red Line is the Grading Curve (COLTO Classification = G8 (#)) (TRH 14 Classification = G9)

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	31%	33%	35%	36%	44%	53%	53%	77%	77%	80%	80%	88%	88%	94%	97%	97%	97%	100%	100%

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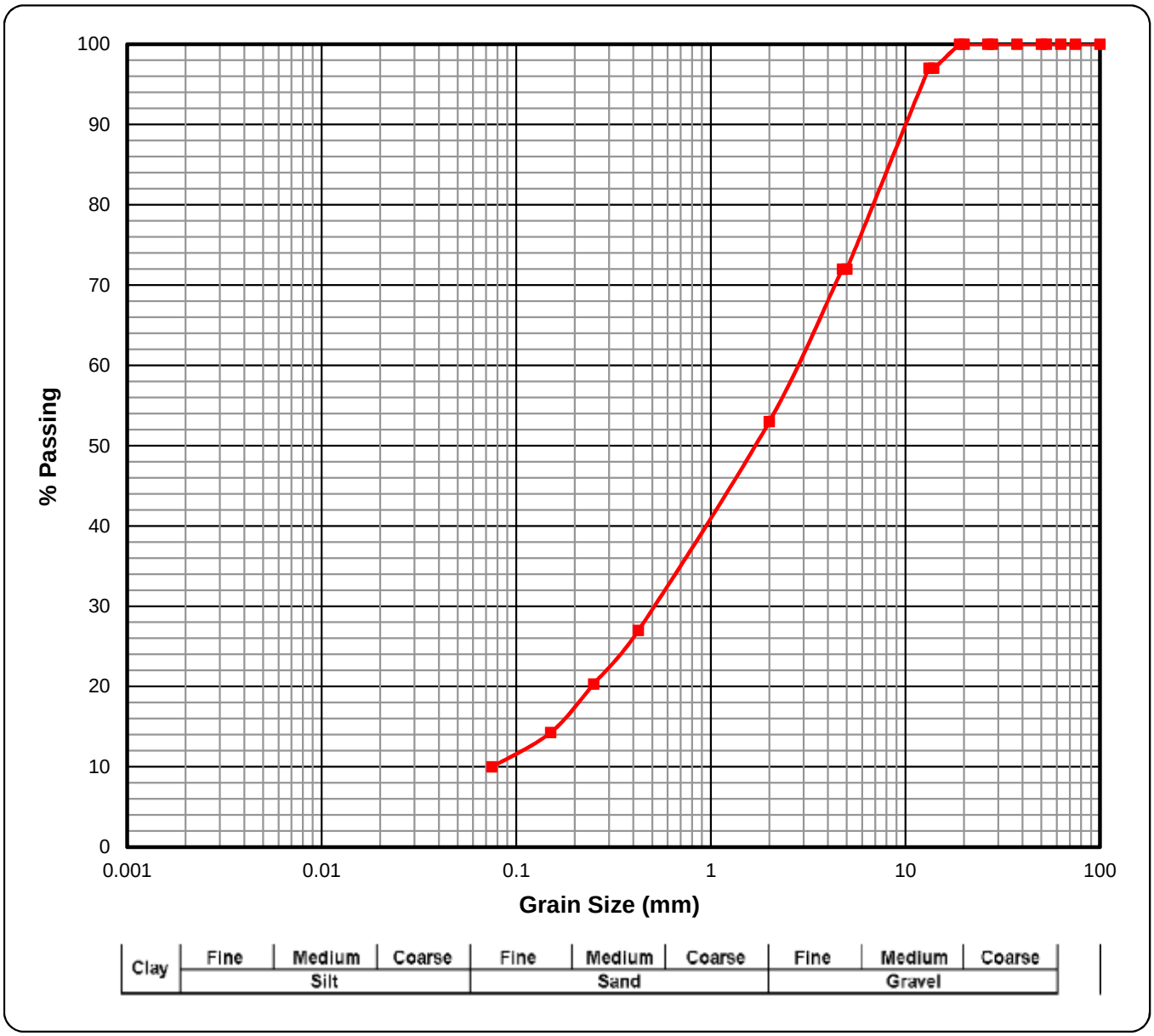
Grading Curve for Sample T25105 – SANS 3001



Thick Red Line is the Grading Curve (COLTO Classification = G6 (#)) (TRH 14 Classification = G6)

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	10%	14%	20%	27%	53%	72%	72%	97%	97%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

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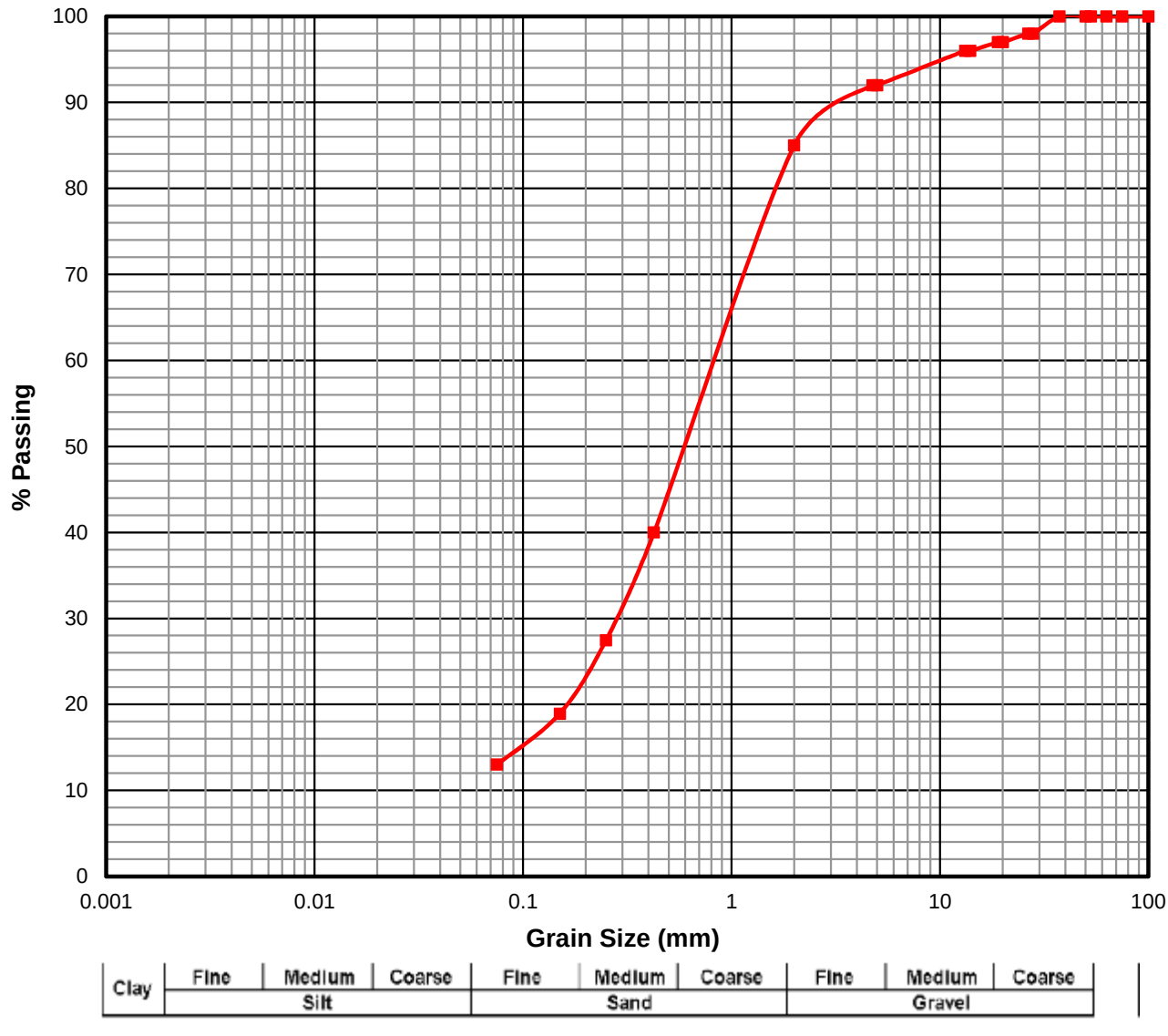
Grading Curve for Sample T25091 – SANS 3001



Thick Red Line is the Grading Curve (COLTO Classification = G6 (#)) (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	13%	19%	27%	40%	85%	92%	92%	96%	96%	97%	97%	98%	98%	100%	100%	100%	100%	100%	100%

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Test Report - SANS 3001

Sample No.		T25095				
Field No.		IP39				
Position		Layer 2				
Depth (m)		0.24-1.00				
Method of Preparation		Scalped				
Material Description		Dark bluish grey stained rusty brown and light yellow highly weathered very soft rock. DOLERITE				
Sieve Analysis - Percent Passing Sieve Size						
Sieve Aperture (mm)	**100.00**	100				
	75.00	91				
	63.00	82				
	53.00	82				
	50.00	77				
	37.50	70				
	28.00	63				
	26.50	63				
	20.00	53				
	19.00	53				
	14.00	49				
	13.20	49				
	5.00	33				
	4.750	33				
	2.000	26				
	0.425	19				
	0.075	13				
Grading Modulus		2.42				
Mechanical analysis - Percent of Soil Mortar (<2 mm) for Grain Size range						
Coarse Sand	**2.000 - 0.425**	27				
Coarse-Fine Sand	**0.425 - 0.250**	7				
Medium-Fine Sand	**0.250 - 0.150**	8				
Fine-Fine Sand	**0.150 - 0.075**	9				
Silt and Clay	**< 0.075**	50				
Atterberg Limits SANS 3001 on <0.425 mm fraction						
Liquid Limit	% or symbol	31				
Plasticity Index	% or symbol	12				
Linear Shrinkage	%	6.0				
Maximum Dry Density and Optimum Moisture Content						
Maximum Dry Density (kg/m³)		2032				
Optimum moisture content (%)		9.6				
California Bearing Ratio						
CBR @100% Compaction	%	41				
CBR @ 98% Compaction	%	30				
CBR @ 97% Compaction	%	26				
CBR @ 95% Compaction	%	19				
CBR @ 93% Compaction	%	14				
CBR @ 90% Compaction	%	8.8				
Swell @100% Compaction	%	0.4				
COLTO Classification (1998)†**		G8 (#)				
TRH 14 Classification (1985)**		G9				
AASHTO Classification (Group Index)**		A-2-6 (0)				
Unified Classification **		GC				

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 5.05 - 14 February 2018

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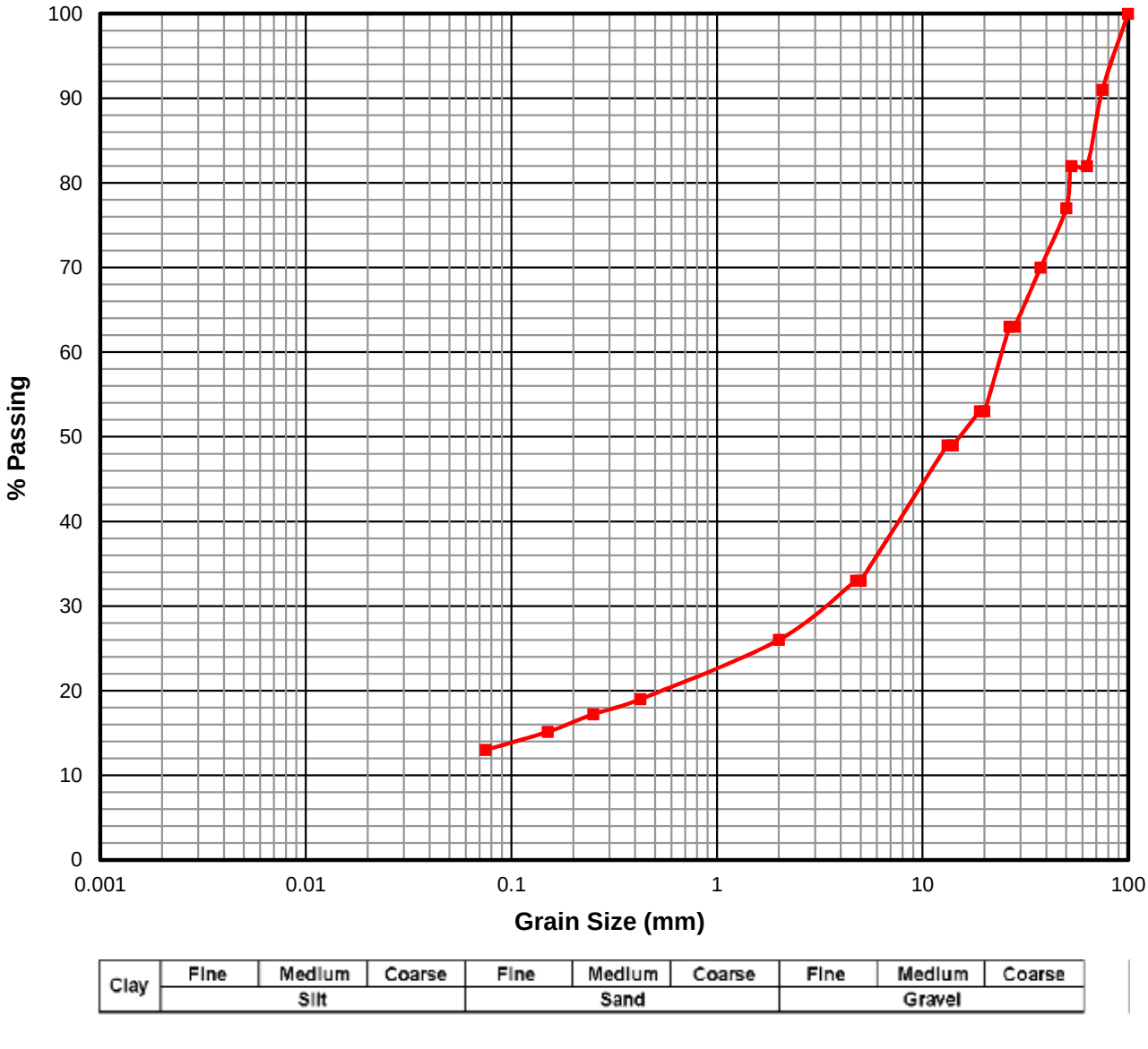
Grading Curve for Sample T25095 – SANS 3001



Thick Red Line is the Grading Curve (COLTO Classification = G8 (#)) (TRH 14 Classification = G9)

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	13%	15%	17%	19%	26%	33%	33%	49%	49%	53%	53%	63%	63%	70%	77%	82%	82%	91%	100%

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Attention : Mr D. Naidoo **Date Reported :** 09.06.2020

TEST REPORT : COMPACTIBILITY FACTOR

(METHOD: SABS 1200)

Sample No.	Field No.	Depth (m)	Material Description	Moisture Content	Compactibility Factor
T25102	IP9	1.34-3.50	Dark reddish brown sandy silty CLAY. Residual Shale	47.7	0.573
T25103	IP10	0.1-0.59	Dark brownish grey clayey SAND. Colluvium	21.7	0.342
T25106	Lethingcebo (Quarry)	0.0-0.5	Light orange brown gravelly silty SAND. Residual Gneiss	3.4	0.633
T25106	IP18	0.01-0.68	Medium brown slightly clayey SAND. Colluvium	4.5	0.402
T25092	IP27	0.01-0.34	Medium brown slightly clayey SAND. Colluvium	21.7	0.372
T25093	IP31	0.01-0.42	Medium brownish grey clayey SAND. Colluvium	21.1	0.382
T25094	IP33	0.01-0.40	Medium brown slightly clayey SAND. Colluvium	13.3	0.462
T25096	IP40	0.01-0.40	Light grey silty SAND. Colluvium	5.3	0.387
T25097	IP47	0.42-0.96	Light orange silty SAND. Residual Sandstone	2.8	0.377
T25098	IP54	0.01-0.80	Medium brownish red silty SAND. Residual Sandstone	3.8	0.432
T25099	IP56	0.01-0.80	Medium orange brown silty SAND. Colluvium	3.7	0.362

Remarks: Date Received: 25.05.2020

Date Tested: 28.05.2020 & 11.06.2020

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Attention : **Mr D. Naidoo** | **Date Reported** : **09.06.2020**

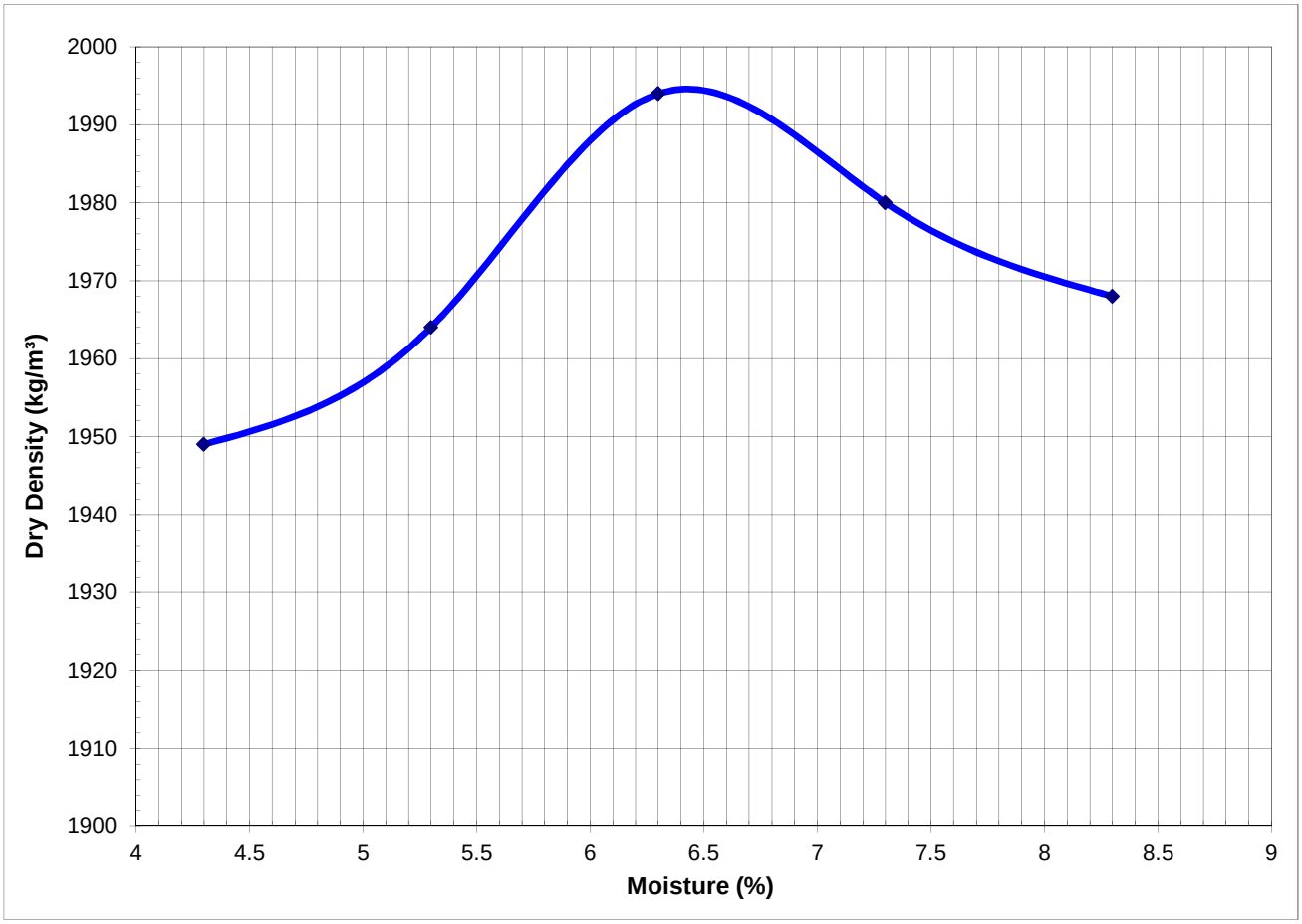
SANS 3001 Moisture/Density Relationship

Sample No.	: T25091	Field No.	: IP20
Method of preparation	: N/A	Depth (m)	: 0.54-1.30
Natural/Stabilised	: Natural	Origin	: Layer 2
Material Description	: Lt.Purp.Gr.Comp.Hi.Wth.very soft rock. SANDSTO	Compaction Effort	: Mod AASHTO

Maximum Dry Density (kg/m³) **1995** **Optimum Moisture Content (%)** **6.4**

Plotted Values:

Moisture (%)	4.3	5.3	6.3	7.3	8.3
Dry Density (kg/m³)	1949	1964	1994	1980	1968



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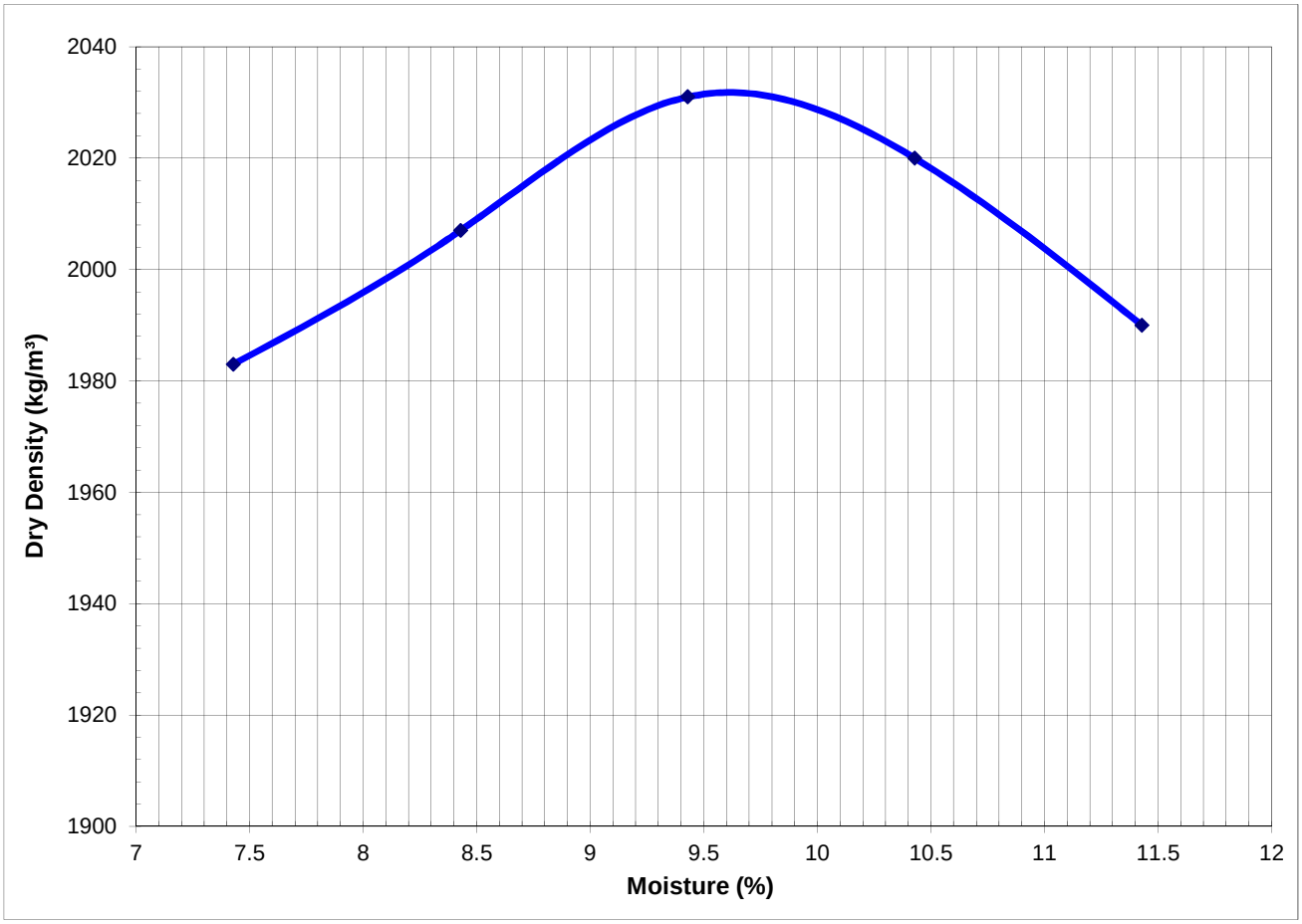
SANS 3001 Moisture/Density Relationship

Sample No.	: T25095	Field No.	: IP39
Method of preparation	: Scalped	Depth (m)	: 0.24-1.00
Natural/Stabilised	: Natural	Origin	: Layer 2
Material Description	: Dk.Bl.Gr.St.Ru.Br.Lt.Yell.Hi.Wth.very soft rock. DO	Compaction Effort	: Mod AASHTO

Maximum Dry Density (kg/m³) **2032** **Optimum Moisture Content (%)** **9.6**

Plotted Values:

Moisture (%)	7.4	8.4	9.4	10.4	11.4
Dry Density (kg/m³)	1983	2007	2031	2020	1990



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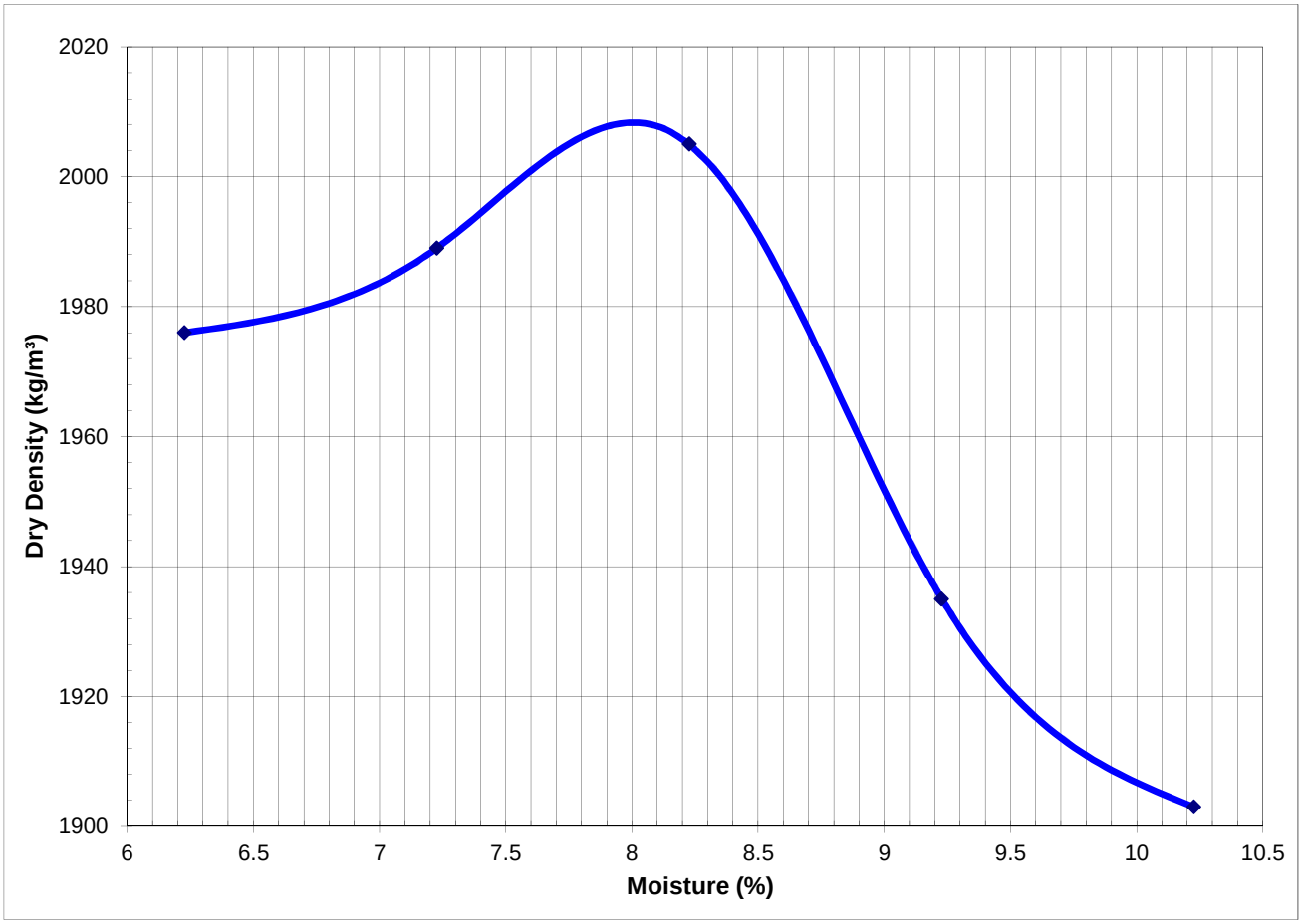
SANS 3001 Moisture/Density Relationship

Sample No.	: T25100	Field No.	: IP4
Method of preparation	: N/A	Depth (m)	: 0.60-0.90
Natural/Stabilised	: Natural	Origin	: Layer 3
Material Description	: Lt.Gr.Or.Hi.Wth.very soft rock. S/Stone	Compaction Effort	: Mod AASHTO

Maximum Dry Density (kg/m³) 2008 **Optimum Moisture Content (%) 8.0**

Plotted Values:

Moisture (%)	6.2	7.2	8.2	9.2	10.2
Dry Density (kg/m³)	1976	1989	2005	1935	1903



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Attention	**: Mr D. Naidoo**	**Date Reported**	**: 09.06.2020**

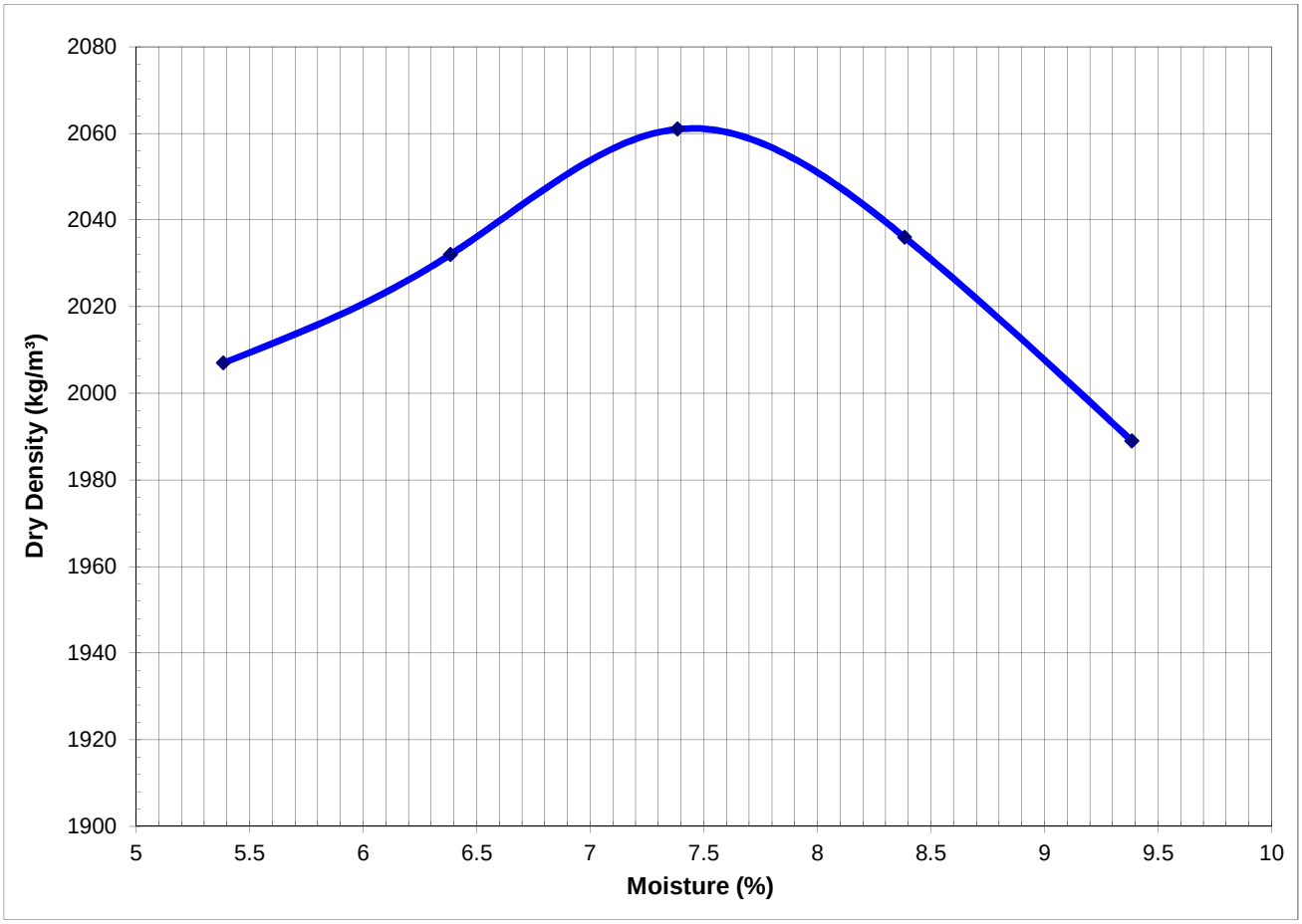
SANS 3001 Moisture/Density Relationship

Sample No.	: T25101	Field No.	: IP5
Method of preparation	: N/A	Depth (m)	: 0.01-0.38
Natural/Stabilised	: Natural	Origin	: Layer 1
Material Description	: Med.Br.Gr.silty SAND. Colluvium	Compaction Effort	: Mod AASHTO

Maximum Dry Density (kg/m³) 2061 **Optimum Moisture Content (%) 7.5**

Plotted Values:

Moisture (%)	5.4	6.4	7.4	8.4	9.4
Dry Density (kg/m³)	2007	2032	2061	2036	1989



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Project : **Proposed Water Supply Scheme at Mpolweni** | **Our Ref No.** : **49173-1**
Attention : **Mr D. Naidoo** | **Date Reported** : **09.06.2020**

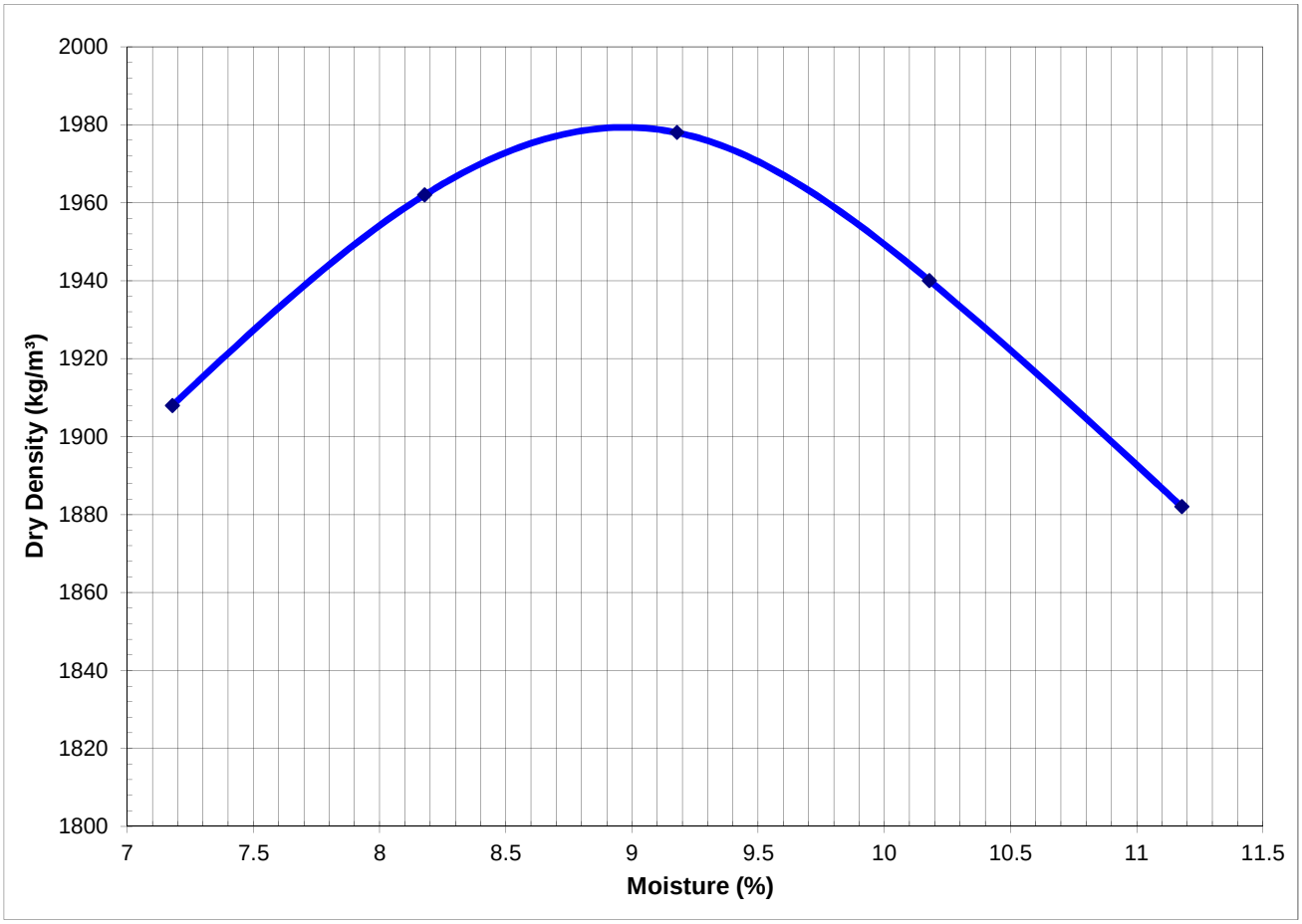
SANS 3001 Moisture/Density Relationship

Sample No.	: T25104	Field No.	: IP14
Method of preparation	: Scalped	Depth (m)	: 0.74-1.62
Natural/Stabilised	: Natural	Origin	: Layer 2
Material Description	: Dk.Bl.Gr.St.Lt.Ru.Br.Hi.Wth.very soft rock. DOL.	Compaction Effort	: Mod AASHTO

Maximum Dry Density (kg/m³) **1979** **Optimum Moisture Content (%)** **9.0**

Plotted Values:

Moisture (%)	7.2	8.2	9.2	10.2	11.2
Dry Density (kg/m³)	1908	1962	1978	1940	1882



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Consulting Engineering Geologists, Geotechnical Engineers, Geotechnicians & Geotechnical Quality Assurance Specialists
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SANS 3001 Moisture/Density Relationship

Sample No.	: T25105	Field No.	: Lethingcebo
Method of preparation	: N/A	Depth (m)	: 0.0-0.5
Natural/Stabilised	: Natural	Origin	: Layer 1
Material Description	: Lt.Or.Br.gravelly silty SAND. Res. Gneiss	Compaction Effort	: Mod AASHTO

Maximum Dry Density (kg/m³) **2147** **Optimum Moisture Content (%)** **7.5**

Plotted Values:

Moisture (%)	5.4	6.4	7.4	8.4	9.4
Dry Density (kg/m³)	2059	2086	2147	2105	2073

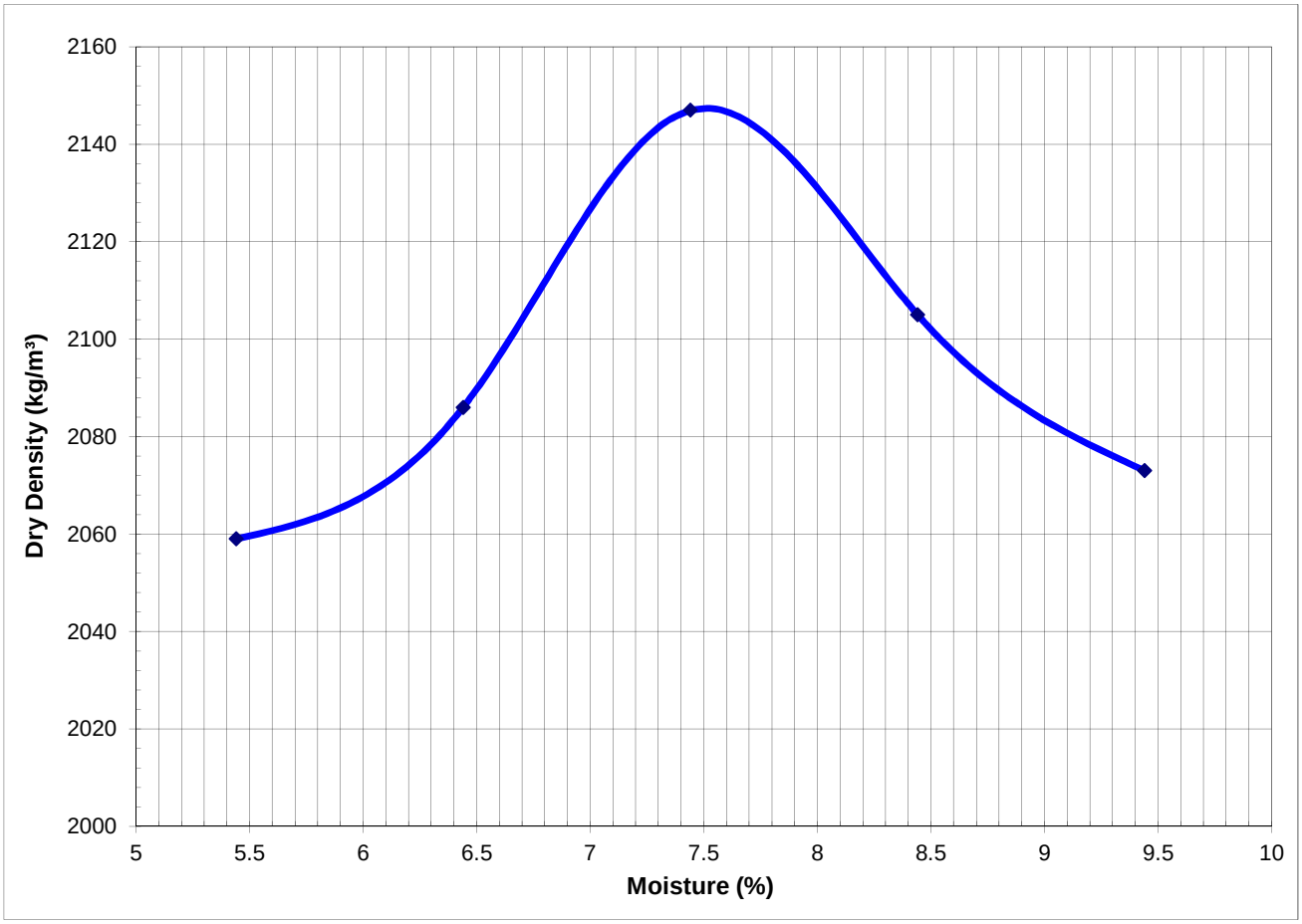

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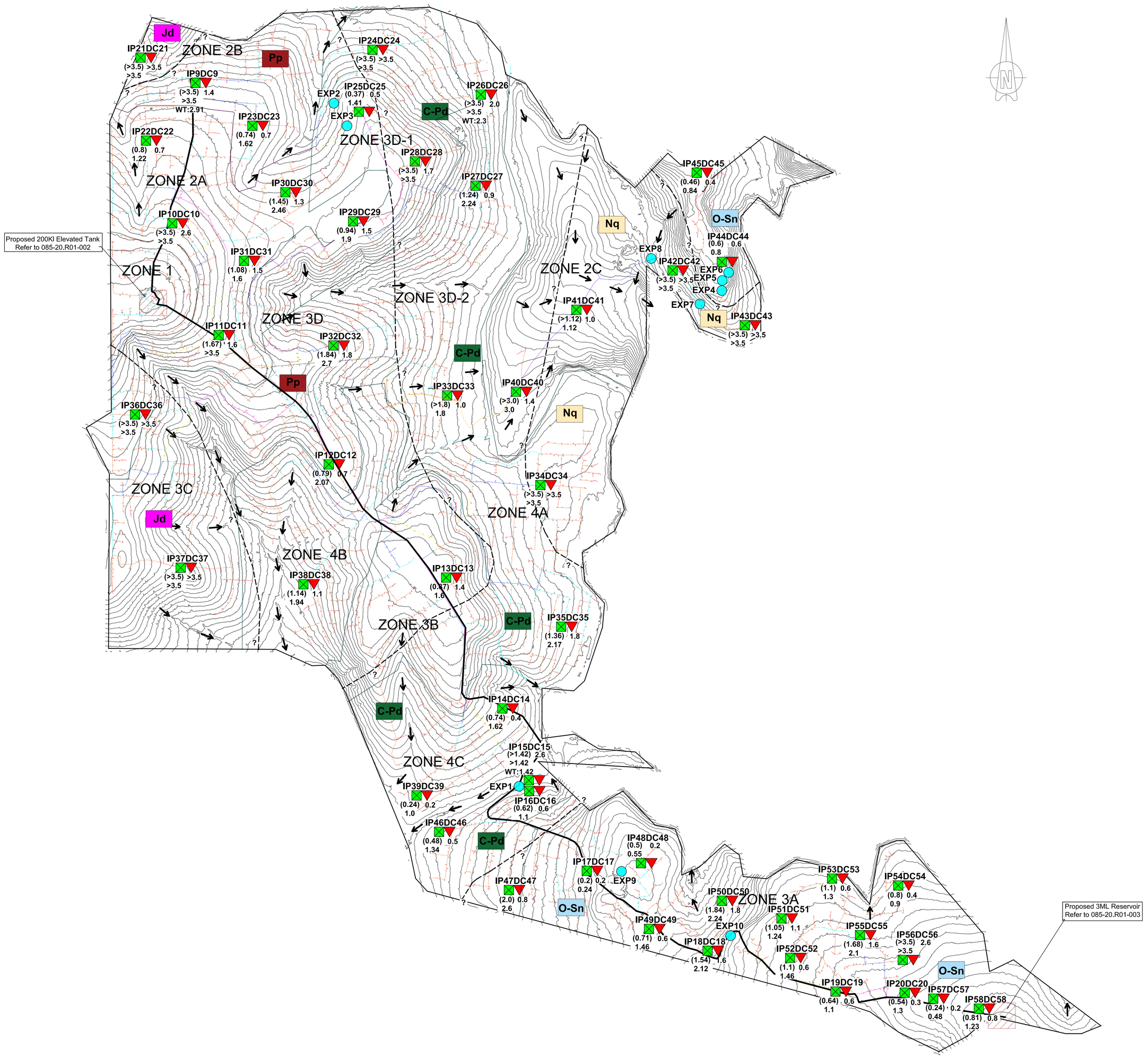
FIGURE 085-20.R01.001:

SITE PLAN (ENTIRE SITE)



KEY:

Site boundary.

Proposed Bulk Pipeline.

IP8 (0.64) 1.2 — Approximate position of Inspection Pit showing depth to rock () and depth to refusal in metres below existing ground level.

DC8 2.0 — Approximate position of CBR Dynamic Cone Penetrometer Test showing depth to refusal in metres below existing ground level.

EXP1 — Approximate position of Exposure Profile.

Approximate alignment and downslope direction of drainage course.

WT:1.42 — Denotes depth to ground water seepage in metres below existing ground level.

INFERRED GEOLOGY:

Jd — Approximate area underlain by Dolerite.

Pp — Approximate area underlain by Shale. Pietermaritzburg Formation.

C-Pd — Approximate area underlain by Tillite. Dwyka Group.

O-Sn — Approximate area underlain by Sandstone. Natal Group.

Nq — Approximate area underlain by Gneiss. Mapumulo Metamorphic Suite.

?– – – –? Inferred geolocial contact.

WATER LEGEND	
SYMBOL	DESCRIPTION
	EXISTING 4 ML RESERVOIR
	25mm DIAMETER PIPE HDPE, CLASS 12
	50mm DIAMETER PIPE HDPE, CLASS 16
	75mm DIAMETER PIPE uPVC, CLASS 12
	110mm DIAMETER PIPE uPVC, CLASS 12
	110mm DIAMETER PIPE uPVC, CLASS 16
	160mm DIAMETER PIPE uPVC, CLASS 12
	160mm DIAMETER PIPE uPVC, CLASS 16
	200mm DIAMETER PIPE uPVC, CLASS 12
	200mm DIAMETER PIPE uPVC, CLASS 16
	200mm DIAMETER PIPE STEEL, CLASS 25
	250mm DIAMETER PIPE uPVC, CLASS 12
	250mm DIAMETER PIPE uPVC, CLASS 16
	250mm DIAMETER PIPE STEEL, CLASS 25
	300mm DIAMETER PIPE STEEL, CLASS 25
	315mm DIAMETER PIPE uPVC, CLASS 12
	315mm DIAMETER PIPE uPVC, CLASS 16
	350mm DIAMETER PIPE STEEL, CLASS 25
	355mm DIAMETER PIPE uPVC, CLASS 12
	400mm DIAMETER PIPE STEEL, CLASS 25
	ISOLATING VALVE
	PRESSURE REDUCING VALVE
	ZONE BOUNDARY
	MPOLWENI BOUNDARY

LIST OF CO ORDINATES:

NO.	Y CO ORDINATE*	X CO ORDINATE*	Z CO ORDINATE:
IP9/DC9	51455.148	3253998.930	722.50
IP10/DC10	53839.224	3256701.150	767.50
IP11/DC11	51313.308	3255550.148	753.50
IP12/DC12	56633.336	3256292.227	765.25
IP13/DC13	49912.980	3257043.405	701.00
IP14/DC14	49567.128	3257848.607	642.50
IP15/DC15	49403.491	3258288.202	609.25
IP16/DC16	49419.528	3258319.063	618.75
IP17/DC17	49048.091	3258847.050	682.25
IP18/DC18	48304.763	3259339.584	727.75
IP19/DC19	47516.789	3259591.810	794.00
IP20/DC20	47093.667	3259599.276	800.00
IP21/DC21	51792.884	3253843.435	725.75
IP22/DC22	51760.890	3254354.418	744.50
IP23/DC23	51106.151	3254262.151	730.50
IP24/DC24	50366.769	3253890.056	676.75
IP25/DC25	50451.374	3254176.080	724.75
IP26/DC26	49699.608	3254071.147	648.00
IP27/DC27	49732.197	3254631.683	660.75
IP28/DC28	50104.911	3254482.451	729.25
IP29/DC29	50486.113	3254850.555	735.75
IP30/DC30	50902.090	3254673.830	724.50
IP31/DC31	51156.317	3255093.732	745.25
IP32/DC32	50606.713	3255614.798	713.00
IP33/DC33	49907.141	3255922.590	639.50
IP34/DC34	49333.241	3256474.310	630.50
IP35/DC35	49205.456	3257345.136	629.25
IP36/DC36	51828.670	3256038.994	745.00
IP37/DC37	51546.711	3256982.990	702.50
IP38/DC38	50791.520	3257084.204	637.25
IP39/DC39	50095.727	3258383.620	617.25
IP40/DC40	49484.013	3255899.178	635.50
IP41/DC41	49111.491	3255395.665	671.75
IP42/DC42	48519.443	3255152.944	653.00
IP43/DC43	48075.884	3255489.751	653.75
IP44/DC44	48212.272	3255114.683	705.50
IP45/DC45	48373.722	3254554.980	708.25
IP46/DC46	49957.284	3258607.782	613.75
IP47/DC47	49527.195	3258966.145	644.25
IP48/DC48	48714.022	3258799.420	710.50
IP49/DC49	48663.763	3259205.644	706.75
IP50/DC50	48217.146	3259031.301	709.25
IP51/DC51	47850.165	3259140.589	772.50
IP52/DC52	47795.239	3259383.605	780.00
IP53/DC53	47538.579	3258896.027	765.75
IP54/DC54	47131.460	3258937.429	772.50
IP55/DC55	47364.644	3259243.234	783.75
IP56/DC56	47102.599	3259396.093	797.25
IP57/DC57	46918.082	3259635.803	819.00
IP58/DC58	46635.146	3259695.906	833.00
EXP1	50605.299	3254121.344	612.00
EXP2	50603.257	3254125.383	700.00
EXP3	50523.770	3254265.697	710.00
EXP4	48216.995	3255271.736	680.00
EXP5	48214.404	3255247.093	701.25
EXP6	48185.025	325182.307	695.50
EXP7	48351.419	3255358.524	653.25
EXP8	48651.858	3255079.615	660.00
EXP9	48832.362	3258855.354	700.00
EXP10	48161.724	3259250.394	750.00

NOTE:
* - Read from Hand Held GPS
: - Approximate elevation inferred from contour survey

Site plan showing co ordinates and approximate positions of:

Inspection Pits;
CBR Dynamic Cone Penetrometer (DCP) Tests;
Exposure Profiles;
Drainage Courses; and
Inferred Geology.

SCALE 1:10 000

0 100 200 Metres

Escongweni BPH Engineers (Pty) Ltd

Proposed Water Supply Scheme at Mpolweni, Umgungundlovu District Municipality
Geotechnical Investigation

GEOSURE (PTY) LTD
Consulting Engineering Geologists, Geotechnical Engineers, Geotechnicians and Geotechnical Quality Assurance Specialists

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DATE: 03-06-2020
DRAWN BY: V.G
CHECKED BY: E.B / F.S
REFERENCE NO. 085-20

085-20.R01-001

FIGURE 085-20.R01.002:

SITE PLAN (200KL ELEVATED TANK)

KEY:

IP1 (>1.3) 1.3 — Approximate position of Inspection Pit showing depth to rock () and depth to refusal in metres below existing ground level.

DC1 >3.5 — Approximate position of CBR Dynamic Cone Penetrometer Test showing depth to refusal in metres below existing ground level.

DPL1 3.9 — Approximate position of Dynamic Cone Penetrometer Light (DPL) Test showing depth to refusal in metres below existing ground level.

LIST OF CO ORDINATES:

NO.	Y CO ORDINATE*	X CO ORDINATE*	Z CO ORDINATE**
IP1/DC1	51724.065	3255333.402	796.75
IP2/DC2/DPL1	51718.645	3255339.535	796.75
IP3/DC3/DPL2	46527.792	3255342.651	796.75

NOTE:
* - Read from Hand Held GPS
** - Approximate elevation Inferred from contoured survey

Co ordinate: 29°24'52.3"S 30°28'01.30"E

Aerial imagesourced from Google Earth

Site plan showing co ordinates and approximate positions of:

Inspection Pits;
CBR Dynamic Cone Penetrometer (DCP) Tests; and
Dynamic Cone Penetrometer Light (DCP) Tests.

SCALE 1:200

0 2 4
Metres

Escongweni BPH Engineers (Pty) Ltd
Proposed Water Supply Scheme at Mpolweni, Umgungundlovu District Municipality
Proposed 200 Kl Elevated Tank - Geotechnical Investigation

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085-20.R01-002

FIGURE 085-20.R01.003:

SITE PLAN (3ML RESERVOIR)

KEY:

IP7
(0.54)
1.1

Approximate position of Inspection Pit showing depth to rock () and depth to refusal in metres below existing ground level.

DC7
0.6

Approximate position of CBR Dynamic Cone Penetrometer Test showing depth to refusal in metres below existing ground level.

LIST OF CO ORDINATES:

NO.	Y CO ORDINATE*	X CO ORDINATE*	Z CO ORDINATE**
IP4/DC4	46527.792	3259729.017	840.25
IP5/DC5	46527.792	3259720.093	839.75
IP6/DC6	46540.753	3259713.992	839.25
IP7/DC7	46546.142	3259714.014	839.75
IP8/DC8	46542.109	3259711.842	838.75

NOTE:
* - Read from Hand Held GPS
** - Approximate elevation inferred from contoured survey

Co ordinate: 29°27'15.79"S 30°31'13.46"E

Aerial imagesourced from Google Earth

Site plan showing co ordinates and approximate positions of:

Inspection Pits; and
CBR Dynamic Cone Penetrometer (DCP) Tests.

SCALE 1:200

0 2 4
Metres

Escongweni BPH Engineers (Pty) Ltd

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