KWAZULU-NATAL PROVINCE
ECONOMIC DEVELOPMENT, TOURISM AND ENVIRONMENTAL AFFAIRS
REPUBLIC OF SOUTH AFRICA

	(For official use only)
Provincial Reference Number:	
NEAS Reference Number:	KZN / EIA /
Waste Management Licence Number (if applicable):	
Date Received by Department:	

DETAILS OF SPECIALIST AND DECLARATION OF INTEREST

Submitted in terms of section 24(2) of the National Environmental Management Act, 1998 (Act No. 107 of 1998) or for a waste management licence in terms of section 20(b) of the National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008).

KINDLY NOTE:

1. This form is current as of **May 2021**. It is the responsibility of the Applicant / Environmental Assessment Practitioner ("EAP") to ascertain whether subsequent versions of the form have been released by the Department.

PROJECT TITLE

Proposed Establishment of a Cemetery within the Dannhauser Local Municipality, KwaZulu-Natal

DISTRICT MUNICIPALITY

Amajuba District Municipality

1. SPECIALIST INFORMATION

Specialist name:	Geotechnical Solutions		
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2. DECLARATION BY THE SPECIALIST

I, **Nishen Govender** ,, declare that --

General declaration:

- I act as the independent specialist in this application;
- do not have and will not have any vested interest (either business, financial, personal or other) in the undertaking of the proposed activity, other than remuneration for work performed in terms of the Environmental Impact Assessment Regulations, 2014;
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, regulations and all other applicable legislation;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- all the particulars furnished by me in this form are true and correct; and
- I am aware that a person is guilty of an offence in terms of Regulation 48 (1) of the EIA Regulations, 2014, if that person provides incorrect or misleading information. A person who is convicted of an offence in terms of sub-regulation 48(1) (a)-(e) is liable to the penalties as contemplated in section 49B(1) of the National Environmental Management Act, 1998 (Act 107 of 1998).

Signature of the specialist:

Geotechnical Solutions

Name of company:

15 November 2021

Date:

APPROVED
By Nishen at 4:59 pm, Nov 15, 2021

Geotechnical Solutions (Pty) Ltd

EARTH CIVIL TESTING

Reg.No.- K2011/115681/01 Tax.No.- 9127/374/18/0
Radiation Control – Authority No. 2962/16/1430
106 Francis Road – P.O. Box 303 - Ladysmith – KwaZulu Natal – 3370
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REPORT TO SIVEST ON THE RESULTS OF A GEOTECHNICAL INVESTIGATION FOR THE PROPOSED CEMETERY SITES AT DURNACOL AND TRY AGAIN FARMS IN DANHAUSER, KWAZULU-NATAL

066-2113-01.R01
Revision 0
18 May 2021

Compiled for:
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4 Pencarrow Crescent,
La Lucia Ridge,
Umhlanga

Compiled by:

Author:	**Nishen Govender** **Pr. Sci. Nat.** **MSc Geohydrology** **PhD Candidate**
Reviewer:	**Kumendrie Naidoo** **Pr. Sci. Nat.** **MSc Mining Engineering** **PhD Candidate**

REPORT TO SIVEST ON THE RESULTS OF A GEOTECHNICAL INVESTIGATION FOR THE PROPOSED CEMETERY SITES AT DURNACOL AND TRY AGAIN FARMS IN DANHAUSER, KWAZULU-NATAL

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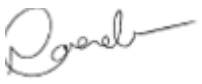
18 May 2021

Prepared For:

SIVEST

Compiled by:
Nishen Govender Pr. Sci. Nat.
BSc Hon and MSc Geohydrology

Approval of Document		
Date:	**18 May 2021**	
Reference:	**066-2113-01.R01**	
Professional Name	**SACNASP No**	**Signature**
Nishen Govender Pr. Sci. Nat. MSc Geohydrology	**400138/17**	
Kumendrie Naidoo Pr. Sci. Nat. MSc Mining Engineering	**400080/2000**	

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begl	Below existing ground level
BH	Borehole
cm	centimetre
DCP	Dynamic Cone Penetrometer Test
E	East
GM	grading modulus
IMC	insitu moisture content
kN/m²	kilonewtons per metre square
LL	liquid limit
LS	linear shrinkage
m	metre (s)
mamsl	Metres above mean sea level
mm	millimetre
No.	number
N	North
PI	plasticity index
SANS	South African National Standards
S	South
s	second
TP	Test Pits
TLB	Tractor loader backactor
WULA	Water Use License Application

1. TERMS OF AGREEMENT AND SCOPE OF SERVICES

Geotechnical Solutions (Pty) Ltd were approached by Sivest to assist with a geotechnical and hydrogeological report for two cemetery sites in Danhauser, KwaZulu-Natal.

Following the tender process, Sivest was appointed by the local authority in the area to proceed with the Environmental Impact Assessment.

The following work has been proposed by Geotechnical Solutions:

- Hand excavated inspections pits.
- Dynamic cone penetration tests.
- Groundwater Quality Assessment.
- Geotechnical and Hydrogeological Report.

This report referenced 066-2133-01.R01 provides the results of the geotechnical and hydrogeological investigation. Included in the report with be recommendations in terms of suitability for use a cemetery site, aquifer contamination risk.

2. CODES OF PRACTICE AND STANDARDS

The services were carried out in accordance to the current level of geotechnical standards practiced by professionals in Southern Africa.

The documents referenced for use is:

- *Site Investigation Code of Practice, 1st Edition, South African Institution of Civil Engineering – Geotechnical Division, January, 2010.*

- *Dippenaar, M.A., Olivier, J., Lorentz, S., Ubomba-Jaswa, E., Abia, A.L.K., and Diamond, R.E. (2018). Environmental Risk Assessment, Monitoring and Management of Cemeteries. Water Research Commission. WRC Report No. 2449/1/18*

The nature of geotechnical engineering is such that variations in soil conditions may occur even where sites seem to be consistent. Variations from what is reported here may become evident during construction and 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 ensure that conditions at variance with those predicted do not occur and to undertake an interpretation of the facts supplied in this report.

It is possible that certain indications of ground stability, contamination, or groundwater levels were latent or otherwise not visible. Opinions are based on what was visible at the time the investigation was conducted.

3. REFERENCED INFORMATION

The following information was used for the project:

i. Kml files issued by Sivest showing the site boundaries.

ii. Council for Geosciences Geological Map Sheet "*2830 Dundee*", to a scale of 1:250 000.

iii. Department of Water and Sanitation Hydrogeological Map Sheet "2730 Vryheid", to a scale of 1:500 000.

iv. Low-resolution satellite imagery sourced from Google Earth (202).

4. INVESTIGATION ACTIVITIES

The field portion of the investigation was carried out over the period 21 April 2021 to 22 April 2021 and comprised the following:

a. Excavation of test pits by hand tools,
b. CBR Dynamic Cone Penetrometer (DCP) testing,

4.1 Test Pitting and Profiling

DURNACOL SITE

Five test pits were excavated across the site and are designated by prefixes PN101 to PN105. The test pits were excavated using hand tools to approximate refusal/final depths in the range 1.6 metres (m) to 1.8m below existing ground level (begl).

TRY AGAIN SITE

Eight test pits were excavated across the site and are designated by prefixes PN201 to PN208. The test pits were excavated using hand tools to approximate refusal/final depths in the range 1.4 metres (m) to 1.9m below existing ground level (begl).

The test pits were profiled in accordance to the South African Geoterminology Guidelines (Brink and bruin, 2002). The test pit profiles are given in Appendix A at the end of this report.

4.2 DCP Testing

DURNACOL SITE

DCP tests were also carried out adjacent to each test pit. A total of five DCP tests were completed. The DCP tests have been designated by prefixes DCP101 to DCP105 extended to approximate refusal/final depths in the range 1.7m to 1.9m begl.

TRY AGAIN SITE

DCP tests were also carried out adjacent to each test pit. A total of eight DCP tests were completed. The DCP tests have been designated by prefixes DCP201 to DCP208 extended to approximate refusal/final depths in the range 1.7m to 1.9m begl

The DCP test results are given in Appendix B at the end of this report

4.3 Percolation Test

Two percolation tests were carried out in accordance with SANS 0400 (Formerly SABS 0400, 1990). The objective of the percolation test is to determine the percolation rates through the subsoil to identify approximate permeability rates.

5. DESCRIPTION OF THE STUDY AREA

There are two proposed cemetery sites that are located approximately 5km from each other. The Durnacol site is located approximately 3.5km southwest of Dannhauser Town and Try Again Site 3.0km south east of Dannahauser town.

The latitude and longitude of the central portion of the Durnacol site is 28.04343 South and 30.03601 East.

The latitude and longitude of the central portion of the Try Again site is 28.01020 South and 30.09490 East.

Both sites comprise an open plot of land with an abundance of vegetation.

The locality of the study area is shown in Figures 1 and 2, and Figures 3 and 4 shows positions of the field test pits. Indicative view of the site is given in Photographs 1 to 3.

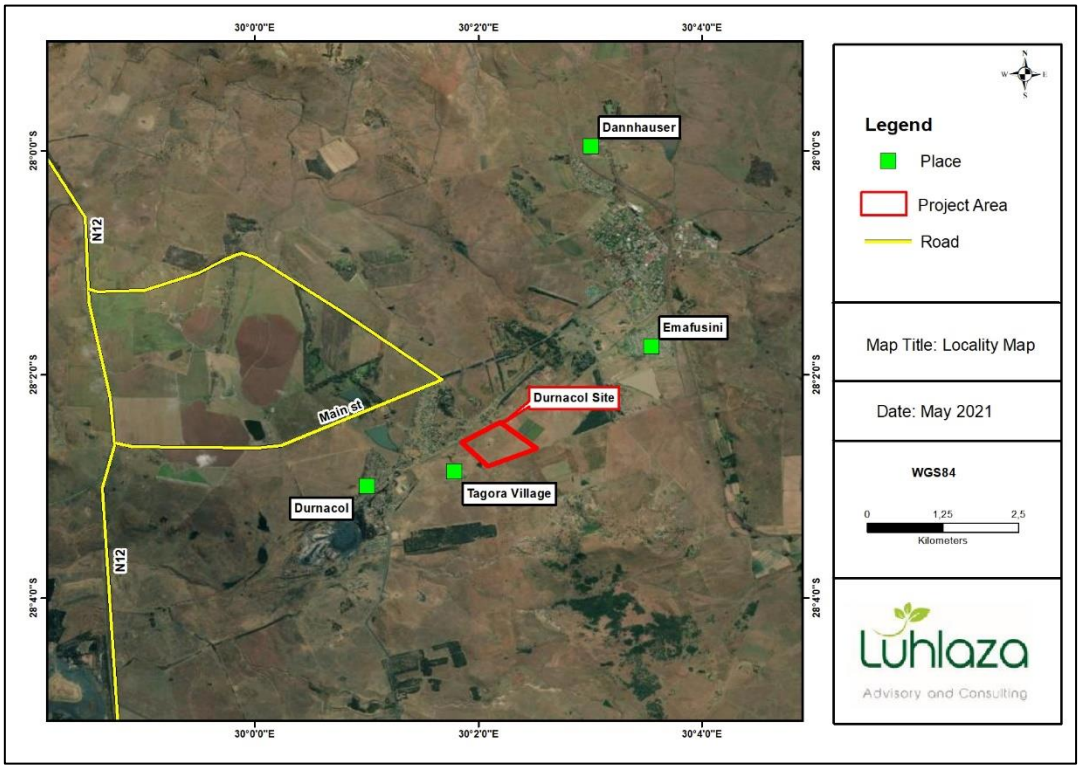

Figure 1: Locality of Durnacol Site

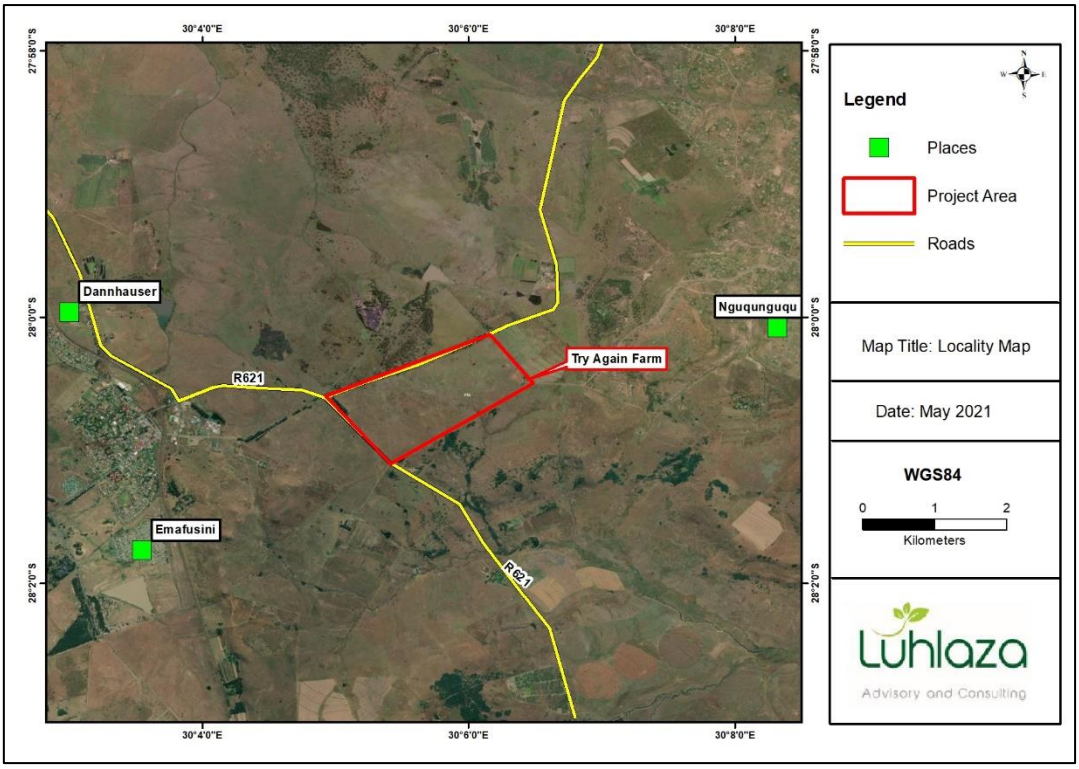

Figure 2: Locality of Try Again Site

Photograph 1: Indicative view of Durnacol Site

Photograph 2: Indicative view of Try Again Site

Photograph 3: Indicative view of the surface water feature close to Durnacol site

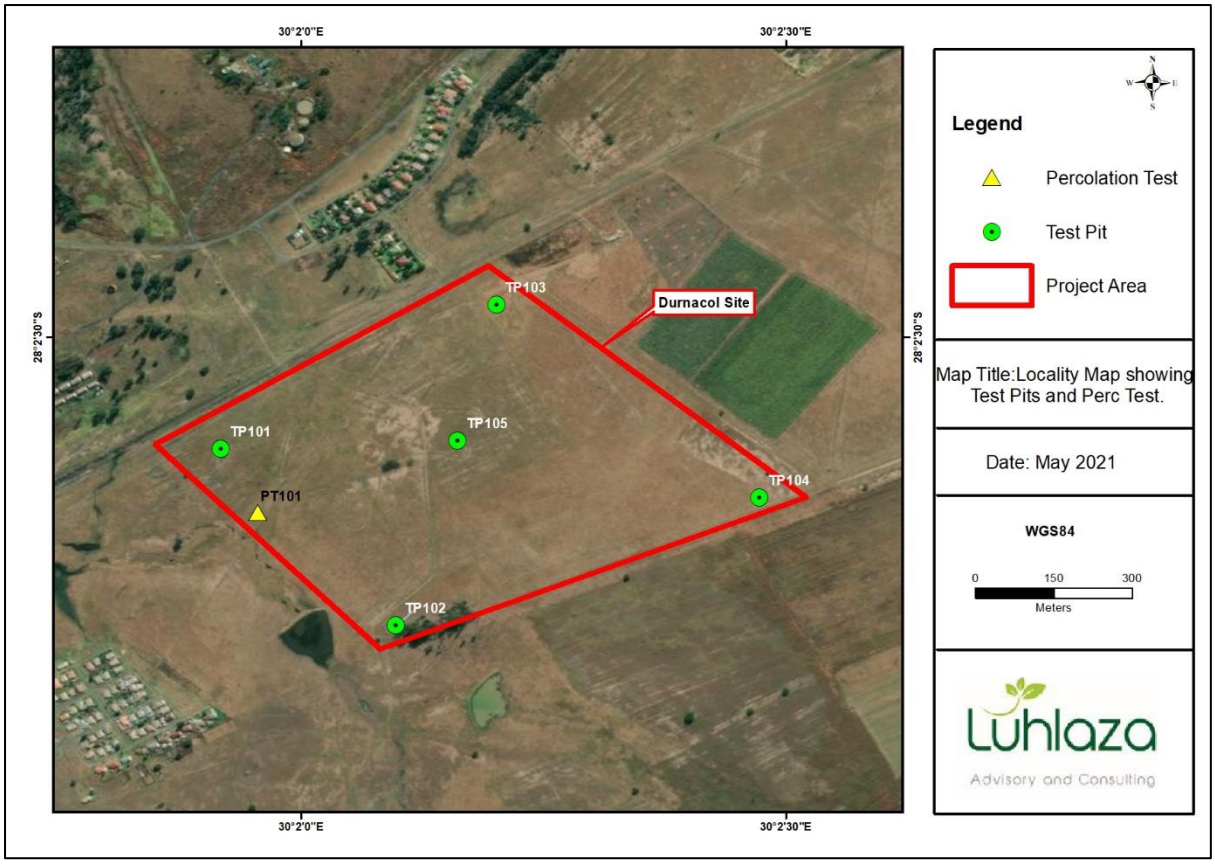

Figure 3: Field Test Positions of Durnacol Site

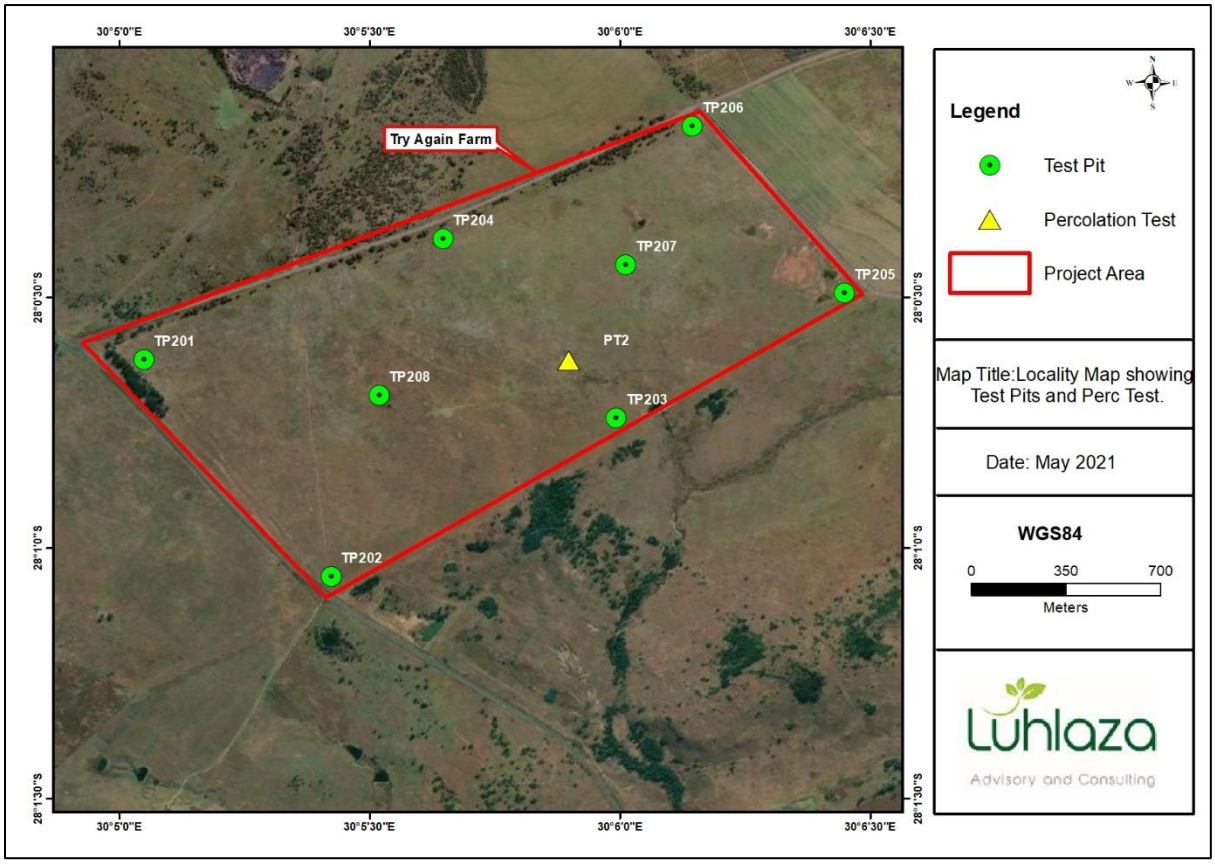

Figure 4: Field Test Positions of Try Again Site

6. CLIMATIC CONDITIONS

The area is associated with relatively hot summer months which lasts from November to March and have temperatures up to 27°C with a low of 16°C. The coldest months are from May to July and have temperatures up to 19°C and low of 4°C. April, August, September and October are relatively warm months.

The wet season is from October to March and dry season is from March to September. The wet season can expect a high of 112mm of rainfall and dry season a low of 3mm.

7. GENERAL GEOLOGY

According to the regional geological map "*2830 Dundee*" (Refer to Figures 5 and 6), the Durnacol site is underlain by Volksrust Formation shale that was intruded by Jurassic dolerite and the Try Again site is underlain by Vryheid Formation sandstone and shale that was intruded by Jurassic dolerite.

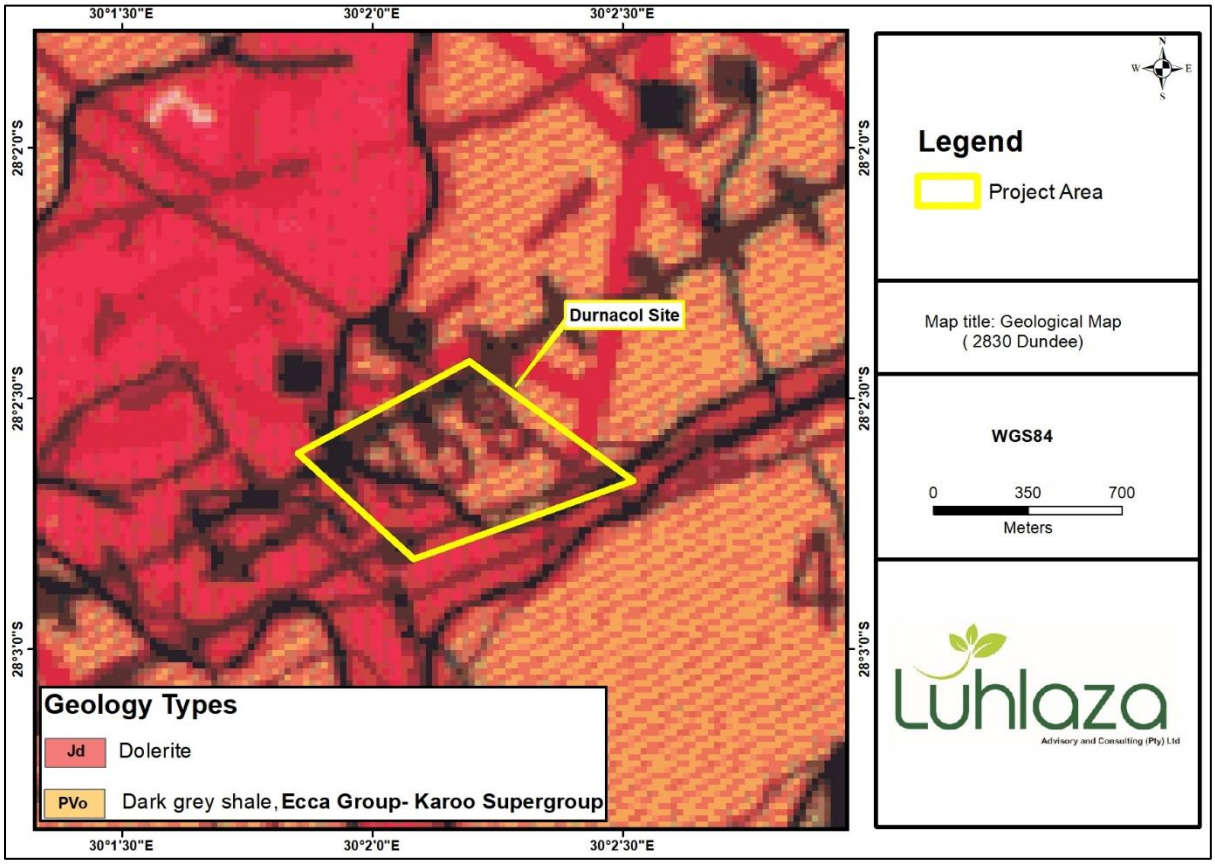

Figure 5: Geological Map of the study area "*2830*" Showing Durnacol Site

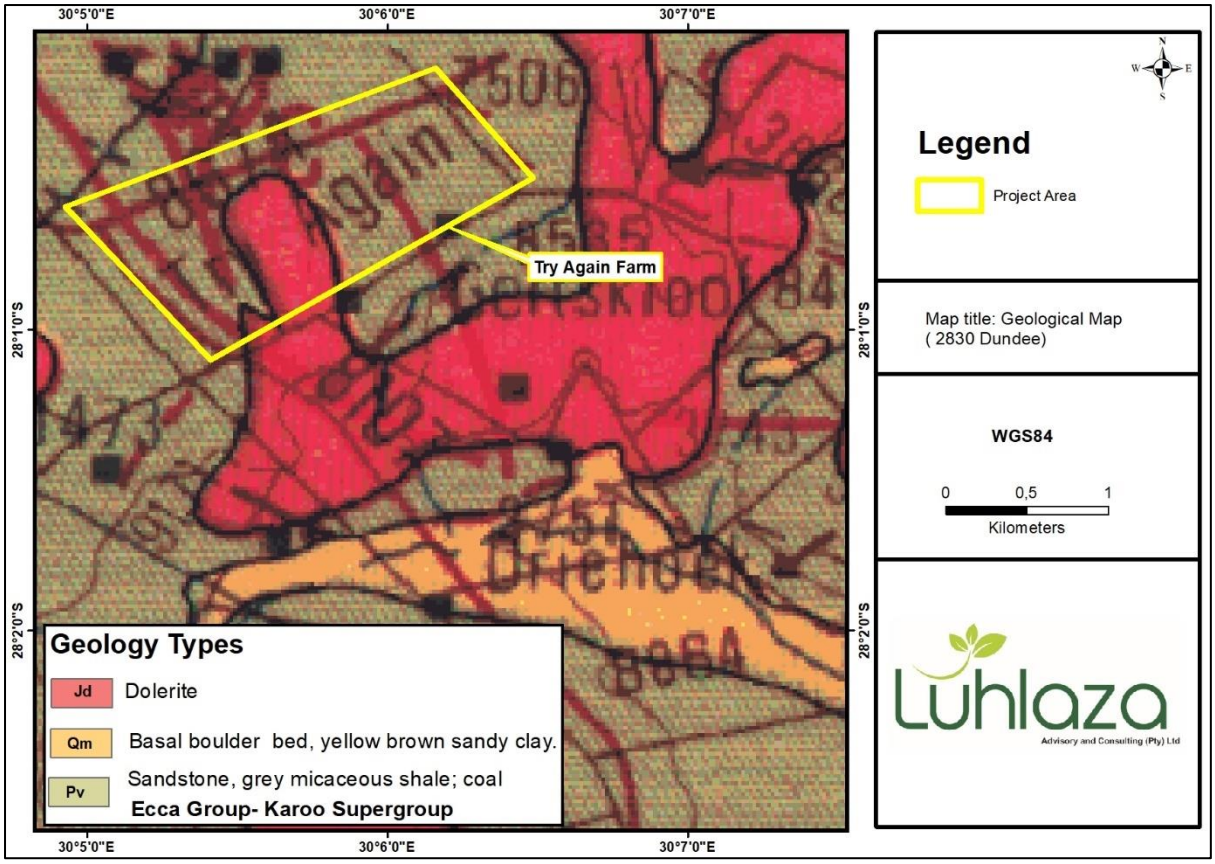

Figure 6: Geological Map of the study area "*2830*" Showing Try Again Site

7.1 Durnacol Geology

The positions investigated at the site comprised clayey colluvial and residual soils that have been derived from the underlying dolerite rock.

The **colluvial** material can be described as slightly moist, pale brown to light brown, firm, fine grained, silty CLAY with roots and vegetation. The colluvial soils extended to approximate depths in the range 0.5m to 0.7m begl (Refer to test pit profiles for exact depths).

The **residual** material can be described as moist, pale brown to orange, firm, intact, silty CLAY with cobbles and pebbles. The cobbles and pebbles appear to be from dolerite rock. The residual material extended to approximate final depth of 1.9m begl (Refer to test pit profiles for exact depths).

Weathered dolerite rock was only encountered in PN101 from an approximate depth of 1.7m begl. The dolerite rock can be described as brown to pale yellow, completely to highly weathered, fine to medium grained, highly fractured, soft rock.

Photographs of subsurface profiles observed in the inspection pits are given in Photographs 4 to 6.

Photograph 4: Material Encountered in TP101

Photograph 5: Material Encountered in TP103

Photograph 6: Material Encountered in TP105

7.2 Try Again Geology

The positions investigated at the site comprised clayey colluvial and residual soils that have been derived from the underlying sandstone rock.

The **colluvial** material can be described as slightly moist, pale brown to light brown, firm, fine grained, silty CLAY with roots and vegetation. The colluvial soils extended to approximate depths in the range 0.5m to 0.7m begl (Refer to test pit profiles for exact depths).

The **residual** material can be described as moist, pale brown to orange, firm, intact, silty CLAY with cobbles and pebbles. The cobbles and pebbles appear to be from dolerite rock. The residual material extended to approximate final depth of 1.8m begl (Refer to test pit profiles for exact depths).

Weathered dolerite rock was only encountered in PN208 from an approximate depth of 1.3m begl. The dolerite rock can be described as brown to pale yellow, completely to highly weathered, fine to medium grained, highly fractured, soft rock.

Photographs of subsurface profiles observed in the inspection pits are given in Photographs 7 to 9.

Photograph 7: Material Encountered in TP203

Photograph 8: Water Seepage and Material Encountered in TP205

Photograph 9: Material Encountered in TP207

8. GROUNDWATER SEEPAGE IN TEST PITS

Majority of the test pits did not encounter groundwater seepage. Moderate groundwater seepage was only encountered in TP205 at a depth of approximately 1.7m begl at the Try Again site. This could pose a risk for the cemetery site as it could lead to saturated grave sites.

It must be noted that groundwater activity is, however, generally expected across the entire site on an intermittent / periodic basis and is also likely to fluctuate as a result of seasonal rainfall patterns.

There is a possibility for an elevated groundwater condition, particularly during periods of rainfall.

9. SOIL LABORATORY RESULTS

The following laboratory tests were carried out on disturbed samples retrieved from the site:

i. Grading Analysis to 0,075mm sieve with Atterberg Limit Determinations, and
ii. Moisture Content.

The results of the soil laboratory tests are attached to the end of this report and summarised in Table 1.

Table 1: Summary of Laboratory Test Results Showing Particle Size Analysis and Material Classification

TP No.	Depth (m)	Description	Particle Size %				Atterberg Limits %			IMC (%)	Unified Classification
			Clay	Silt	Sand	Gravel	LL	PI	LS		
DURNACOL SITE											
TP101	0,8-1,2	Pale brown, silty CLAY - Residual	88		10	2	40,6	10,4	5,3	3,3	OL
TP105	1,0-1,4	Pale brown, silty CLAY - Residual	85		15	0	42,2	12,1	6	3,5	OL
TRY AGAIN SITE											
TP205	1,1-1,5	Dark brown, silty CLAY - Residual	62		37	1	30,6	9,5	4,7	2,7	OL

LL - Liquid Limit
PI - Plasticity Index
A-3 (0) - AASHTO Classification
Low - Expansiveness According to van der Merwe (1964)
LS - Linear Shrinkage
GM - Grading Modulus

10. DISCUSSION

10.1 Proposed Development

Information supplied by the client indicates that two sites have been identified as potential cemetery sites which have already been shown in Figures 1 and 2.

10.2 Excavatability For the Grave Sites

The excavations have been assessed based on SANS 1200 (Latest version). Based on the results of the field investigation, it is inferred that the subsurface classifies as soft excavation down to the final depths of the field tests (TP and DCP results refers) and can easily be excavated using hand tools.

Durnacol Site - Based on the site investigation, excavation by hand tools is considered easy down to depths in the range 1.7m to 1.9m begl. Thereafter, intermediate to hard is anticipated, however, with a TLB it should easily excavate the residual soils unless rock is encountered, which will hinder excavations. The sidewalls are considered relatively stable over the short period.

Try Again Site - Based on the site investigation, excavation by hand tools is considered easy down to depths in the range 1.7m to 1.9m begl. There however, certain areas in which test pit refused at 1.4m due to rock being encountered. This is considered as a intermediate to hard excavations. Intermediate to hard is anticipated at depths greater than 1.7m begl, however, with a TLB it should easily excavate the residual soils unless rock is encountered, which will hinder excavations. The sidewalls are considered relatively stable over the short period.

10.3 Leachate Migration

The percolation test is used to determine the subsoil percolation rates.

Table 2: Percolation test results showing drop (mm) in water level for every 5 minutes

TIME (minutes)	PT101	PT201
	DROP IN WATER LEVEL (mm)	
0	300	300
5	280	271
10	263	255
15	229	218
20	185	190
25	160	158
30	135	137
35	119	96
Depth to base of percolation test pit	0.6-0.9	0.6-0.9
Calculated Co-Efficient of Permeability (m/s) (0min to 35min data)	3.30×10^{-5}	1.89×10^{-4}

Co-efficient of permeability (K) = $[D_{(radius)} \times \ln (h_1 / h_2)]/2(t_2-t_1)$

These soils are inferred to have a permeability of approximately 3.30×10^{-5} to 1.89×10^{-4} m/s, which is classified as semi permeable to impermeable soils for both sites.

According to the Council for Geoscience, Cemetery Site Classification (2004), permeabilities between $\times 10^{-4}$ and $\times 10^{-5}$ are classified as partially suitable for the site.

10.4 Basal Buffer Zone

Based on the results of the hydrocensus the static groundwater level in the area is roughly at 16m begl. The depth to potable groundwater is roughly 66m begl which is where the groundwater strikes was encountered.

Durnacol Site – No groundwater was encountered in any of the inspection pits on site. However, there are a few water bodies located downgradient from the site. Considering that weathered dolerite rock was encountered at the site, particularly down gradient, and dolerite is generally and impermeable rock. This will form an impermeable layer and limit any contamination to the potable groundwater source.

Try Again Site – Groundwater seepage was encountered in a single test pit on site at a depth of approximately 1.7m begl. This is a concern for the site. Based on this it appears that the north eastern part of this site should be avoided for any cemetery development. Also, considering that weathered dolerite rock was encountered at the

site, and dolerite is generally and impermeable rock. This will form an impermeable layer and limit any contamination to the potable groundwater source.

The recommended buffer zone between the base of the grave and the top of the water table should be at least 2.5m for similar environments.

Based on the recommendations of the Department of Environmental affairs, a grave approximately 1.8m deep with a 2.5m buffer zone should not encounter any groundwater within 4.3m begl of the subsurface profile.

The elevated groundwater seepage on site is a concern, however, it should be noted that this is from the perched aquifer and not the potable water aquifer. The potable groundwater source is located at a depth of 66m begl (based on hydrocensus data).

However, there is no conclusive evidence that there is at least a 2.5m buffer zone between the base of the grave and the water table in the area.

It is suggested that further investigations be carried out at the site comprising boreholes to determine the actual groundwater depth.

Tentatively, based on the existing data the Durnacol site is the most feasible in terms of buffer zone.

10.5 Soil Workability

Due to the clay content in soils the materials classify as OL. These are not the best soils in terms of building standards, however, for general backfill for a grave site is considered as acceptable as there are not alternatives in the area with different soils.

There is still the risk of subsidence at both sites and the requirement of relevelling before any memorial structure is constructed over the grave.

11. RATING OF CEMETERY SITE

11.1 Hanbury and Hall (1990) and Dippenaar et al. (2018)

The alternative cemetery sites have been rated based on the Hall and Hanbury (1990) and revised document by Matthys Dippenaar in 2018 for cemetery site classifications and are summarised in Table 3.

Table 3: Summary of Cemetery Site Classification

Excavatability Ratings				
Description	**Assessment**	**Rating**	**Durnacol**	**Try Again**
Easy Spade	Geological pick pushed in 50mm with ease	15	13	13
Pick and Spade	Geological Pick has slight indentation	10		
Machine	Geological pick has firm blows (1-3mm)	5		
Blasting	Backactor refusal	0		
Stability Ratings				
Stable	Little overbreak and safe for profiling	20	20	20
Overbreak	Over breaks between 1,3 and 1,8m	15		
Slightly Unstable	Minor falls of material	8		
Unstable	Collapse of excavation likely	1		
Workability Ratings				
	Unified Class			
Excellent to good	GW,SW, GP	10	2	2
Fair	SP, SM	5		
Poor	OL, CL, ML	2		
Very Poor	OH, CH, MH	0		
Water Table Ratings				
	Water Table Depth (m begl)			
Deep water table	>8	25	15	5
Intermediate	4 to 8	15		
Possible perched water table	0 to 4	5		
water logged soil	0 to 4	Fail		
Subsoil Permeability Rating				
	Approximate permeability (cm/sec)			
Impermeable	$<10^{-5}$	15	20	20
Relatively impermeable	10^{-4} to 10^{-5}	20		
Relatively Permeable	10^{-3} to 10^{-4}	10		
Permeable	$>10^{-3}$	0		
Backfill Permeability Ratings				
	Unified Class			
Impermeable	OH/CL/CH	5	5	5
Relatively impermeable	GC/SC/MH	10		
Relatively Permeable	GP/SP/GW	7		
Permeable	SW/SP	0		
Total Score			**75**	**65**

Table 4 provides the final ranking classification and the suitability for use as a cemetery site.

Table 4: Suitability of Cemetery Site

Final Ranking	Suitability	Site Classifications
>90	Very Good	Durnacol appears to provide as satisfactory whilst, Try Again classifies as poor.
75 to 90	Satisfactory	
60 to 75	Poor	
<60	Unacceptable	

At present it appears that Durnacol site is the most feasible site for a cemetery. But there is a concern with the groundwater level, and before the final site is selected it is suggested that additional investigations such as boreholes be drilled to confirm the water table and geology down to at least 15m begl. The object is mainly to identify the dolerite depth across the sites as this will form the impermeable membrane that prevents contamination and, also to identify the groundwater levels.

11.2 Council for Geosciences Cemetery Guidelines

The alternative cemetery sites have been rated based on the Council for Geosciences document for cemetery site classifications and are summarised in Table 5.

Table 5: Summary of Cemetery Site Classification

Description	Acceptable Limits	Durnacol Site	Try Again Site
Site Topography	Less than 6°	Suitable	Partially Suitable
Soil Excavatibility	Easy	Partially Suitable	Partially Suitable
Site Drainage	Good	Suitable	Issues with drainage due
Soil Permeability	$5x10^{-5}$	Suitable	Suitable
Distance from Domestic Water Supply	465m	Suitable	Suitable
Distance from Drainage Feature	415m	Partially Suitable	Partially Suitable
Basal Buffer Zone	2.5m	Partially suitable pending outcome of further investigation	Not suitable shallow groundwater table
Grave Stability	Firm to Stiff	Suitable	Suitable
Soil Workability	Easily workable	Suitable	Suitable
Cemetery Size	Depending on population size	Considered suitable	Considered Suitable

Based on the classification of the site, the area is deemed suitable for a cemetery site.

Both the Hanbury and Hall, and Council for Geoscience Guidelines cover geotechnical and groundwater stability of the site and are found that the most suitable site for the cemetery is Durnacol. However, this is subject to additional groundwater studies comprising boreholes and following recommendation given in this report.

12. CONCLUDING REMARKS

i. The ground conditions identified refer to the investigated positions on site.
ii. The subsurface soil profile comprises mainly clayey soils derived from the weathering of the dolerite bedrock.
iii. The depth to groundwater in the area is considered to vary and the depth is not confirmed beneath the site. Thus it is recommended that a supplementary investigation comprising boreholes be carried out to confirm this.

iv. The cemetery site has been classified according to various guidelines which take into consideration geotechnical and groundwater parameters.
v. Geotechnically, and Hydrogeologically the Durnacol site is acceptable as a cemetery site, provided that further investigations are carried out to confirm groundwater levels.

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 may be encountered elsewhere on site.

13. REFERENCES

1) Brink, A., & Bruin, R. (2002). Guidelines for Soil and Rock Logging in South Africa. Proceedings of the Geoterminology Workshop. South Africa: Association of Engineering Geologists, South African Institute of Civil Engineering and South African Institute for Engineering and Environmental Geologists.

2) Dippenaar, M.A., Olivier, J., Lorentz, S., Ubomba-Jaswa, E., Abia, A.L.K., and Diamond, R.E. (2018). Environmental Risk Assessment, Monitoring and Management of Cemeteries. Water Research Commission. WRC Report No. 2449/1/18

3) Hall, B.M. and Hanbury, R. (1990). Some Geotechnical Considerations in the Selection of Cemetery Sites. IMIESA March 1990: 2125

4) Richards, N.P and Croukamp, L. (2004). Guidelines for Cemetery Site Selection. Preliminary Report. Council for Geosciences, Pretoria, South Africa.

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GEO - SOL
EARTH CIVIL TESTING

Excavation Test Pit Profile

PROJECT NUMBER:	066-2113-01	TEST PIT DATE:	21/04/2021	CORDINATES - X	28° 2.602'S
PROJECT NAME:	Durnacol Cemetery	GEOTECHNICIAN:	SJ - NM - ZB	CORDINATES - Y	30° 1.915'E
CLIENT:	Sivest	EXCAVATION ME	Manual Excavation	ELEVATION - Z-	1341m
ADDRESS:	4 Pencarrow Crescer	TOTAL DEPTH:	1,8m	LOGGED BY:	Nilesh Mahadew
	La Lucia Ridge - Umhlanga - 4320	SLOPE DRAINAGE	North West	CHECKED BY:	James Harvey Ewusi

PROFILE NUMBER - 101

Depth (m)	Samples	Material Description	Soil Horizon	PHOTOS
0 – 0,5		Slightly moist, pale brown to light brown, fine grained, firm silty clay - colluvium	A	
0,6 – 1,7	101A	Moist pale brown to orange, firm, silty clay - residual with cobbles and pebbles	B	●
1,8 – 2,0		Brown to pale orange, completely to highly weathered, fine to medium grained, highly fractured, soft rock - Dolerite (Jurassic Age)		

Manual Refusal @1,8m

No Groundwater in Test Pit

▶ Undisturbed Sample

● Disturbed Sample

GEO - SOL
EARTH CIVIL TESTING

Excavation Test Pit Profile

PROJECT NUMBER:	066-2113-01	TEST PIT DATE:	21/04/2021	CORDINATES - X	28° 2.786'S
PROJECT NAME:	Durnacol Cemetery	GEOTECHNICIAN:	SJ - NM - ZB	CORDINATES - Y	30° 2.096'E
CLIENT:	Sivest	EXCAVATION ME	Manual Excavation	ELEVATION - Z-	1345m
ADDRESS:	4 Pencarrow Crescer	TOTAL DEPTH:	1,8m	LOGGED BY:	Nilesh Mahadew
	La Lucia Ridge - Umhlanga - 4320	SLOPE DRAINAGE	North West	CHECKED BY:	James Harvey Ewusi

PROFILE NUMBER - 102

Depth (m)	Samples	Material Description	Soil Horizon	PHOTOS
0 – 0,6		Slightly moist, pale brown to light brown, fine grained, firm silty clay - colluvium	A	
0,7 – 1,8		Moist pale brown to orange, firm, silty clay - residual with cobbles and pebbles	B	
1,9 – 2,0				

No Manual Refusal @1.8m

No Groundwater in Test Pit

▶ Undisturbed Sample

● Disturbed Sample

GEO - SOL
EARTH CIVIL TESTING

Excavation Test Pit Profile

PROJECT NUMBER:	066-2113-01	TEST PIT DATE:	21/04/2021	CORDINATES - X	28° 2.455'S
PROJECT NAME:	Durnacol Cemetery	GEOTECHNICIAN:	SJ - NM - ZB	CORDINATES - Y	30° 2.198'E
CLIENT:	Sivest	EXCAVATION ME	Manual Excavation	ELEVATION - Z-	1350m
ADDRESS:	4 Pencarrow Crescer	TOTAL DEPTH:	1,6m	LOGGED BY:	Nilesh Mahadew
La Lucia Ridge - Umhlanga - 4320		SLOPE DRAINAGE	North West	CHECKED BY:	James Harvey Ewusi

PROFILE NUMBER - 103

Depth (m)	Samples	Material Description	Soil Horizon	PHOTOS
0 – 0,5		Slightly moist, pale brown to light brown, fine grained, firm silty clay - colluvium	A	
0,6 – 1,6		Moist pale brown to dark brown, firm, silty clay - residual with cobbles and pebbles	B	
1,7 – 2,0				

No Manual Refusal @1,6m

No Groundwater in Test Pit

▶ Undisturbed Sample

● Disturbed Sample

GEO - SOL
EARTH CIVIL TESTING

Excavation Test Pit Profile

PROJECT NUMBER:	066-2113-01	TEST PIT DATE:	21/04/2021	CORDINATES - X	28° 2.657'S
PROJECT NAME:	Durnacol Cemetery	GEOTECHNICIAN:	SJ - NM - ZB	CORDINATES - Y	30° 2.475'E
CLIENT:	Sivest	EXCAVATION ME	Manual Excavation	ELEVATION - Z-	1354m
ADDRESS:	4 Pencarrow Crescer	TOTAL DEPTH:	1,8m	LOGGED BY:	Nilesh Mahadew
	La Lucia Ridge - Umhlanga - 4320	SLOPE DRAINAGE	North West	CHECKED BY:	James Harvey Ewusi

PROFILE NUMBER - 104

Depth (m)	Samples	Material Description	Soil Horizon	PHOTOS
0 – 0,4		Slightly moist, pale brown to light brown, fine grained, firm silty clay - colluvium	A	
0,5 – 1,7		Moist pale brown to dark brown, firm, silty clay - residual with cobbles and pebbles	B	
1,8 – 1,9				

No Manual Refusal @1,8m

No Groundwater in Test Pit

▶ Undisturbed Sample

● Disturbed Sample

GEO - SOL
EARTH CIVIL TESTING

Excavation Test Pit Profile

PROJECT NUMBER:	066-2113-01	TEST PIT DATE:	21/04/2021	CORDINATES - X	28° 2.598'S
PROJECT NAME:	Durnacol Cemetery	GEOTECHNICIAN:	SJ - NM - ZB	CORDINATES - Y	30° 2.158'E
CLIENT:	Sivest	EXCAVATION ME	Manual Excavation	ELEVATION - Z-	1348m
ADDRESS:	4 Pencarrow Crescer	TOTAL DEPTH:	1,8m	LOGGED BY:	Nilesh Mahadew
	La Lucia Ridge - Umhlanga - 4320	SLOPE DRAINAGE	North West	CHECKED BY:	James Harvey Ewusi

PROFILE NUMBER - 105

Depth (m)	Samples	Material Description	Soil Horizon	PHOTOS
0 – 0,6		Slightly moist, pale brown to light brown, fine grained, firm silty clay - colluvium	A	
0,7 – 1,8	105B	Moist pale brown to brown, firm, silty clay - residual with cobbles and pebbles	B	●
1,9 – 2,0				

No Manual Refusal @1,8m

No Groundwater in Test Pit

▶ Undisturbed Sample

● Disturbed Sample

GEO - SOL
EARTH CIVIL TESTING

Excavation Test Pit Profile

PROJECT NUMBER:	066-2113-01	TEST PIT DATE:	21/04/2021	CORDINATES - X	28° 2.673'S
PROJECT NAME:	Durnacol Cemetery	GEOTECHNICIAN:	SJ - NM - ZB	CORDINATES - Y	30° 1.954'E
CLIENT:	Sivest	EXCAVATION ME	Manual Excavation	ELEVATION - Z-	1338m
ADDRESS:	4 Pencarrow Crescer	TOTAL DEPTH:	0.6m	LOGGED BY:	Nilesh Mahadew
	La Lucia Ridge - Umhlanga - 4320	SLOPE DRAINAGE	North West	CHECKED BY:	James Harvey Ewusi

PROFILE NUMBER - Percolation Test P101

Depth (m)	Samples	Material Description	Soil Horizon	PHOTOS
0 – 0,5		Slightly moist, pale brown to light brown, fine grained, firm silty clay - colluvium		 
0,6 – 2,0		Moist pale brown to orange, firm, silty clay - residual with cobbles and pebbles		

Percolation Test Drop After 2 Hours of Soaking - 119mm/11.9cm

No Groundwater in Test Pit

▶ Undisturbed Sample

● Disturbed Sample

GEO - SOL
EARTH CIVIL TESTING

Excavation Test Pit Profile

PROJECT NUMBER:	067-2114-01	TEST PIT DATE:	22/04/2021	CORDINATES - X	28° 0.623'S
PROJECT NAME:	Try Again	GEOTECHNICIAN:	SJ - NM - ZB	CORDINATES - Y	30° 5.052'E
CLIENT:	Sivest	EXCAVATION ME	Manual Excavation	ELEVATION - Z-	1380m
ADDRESS:	4 Pencarrow Crescer	TOTAL DEPTH:	1,9m	LOGGED BY:	Nilesh Mahadew
	La Lucia Ridge - Umhlanga - 4320	SLOPE DRAINAGE	Southeast	CHECKED BY:	James Harvey Ewusi

PROFILE NUMBER - 201

Depth (m)	Samples	Material Description	Soil Horizon	PHOTOS
0 – 0,6		Slightly moist pale to light brown firm, fine grained, silty clay - colluvium with roots and vegetation	A	
0,7 – 1,9		Moist pale brown to orange, firm, intact silty clay with cobbles and pebbles - residual	B	
2,0				

No Manual Refusal @1,9m

No Groundwater in Test Pit

▶ Undisturbed Sample

● Disturbed Sample

GEO - SOL
EARTH CIVIL TESTING

Excavation Test Pit Profile

PROJECT NUMBER:	067-2114-01	TEST PIT DATE:	22/04/2021	CORDINATES - X	28° 1.055'S
PROJECT NAME:	Try Again	GEOTECHNICIAN:	SJ - NM - ZB	CORDINATES - Y	30° 5.423'E
CLIENT:	Sivest	EXCAVATION ME	Manual Excavation	ELEVATION - Z-	1384m
ADDRESS:	4 Pencarrow Crescer	TOTAL DEPTH:	1,9m	LOGGED BY:	Nilesh Mahadew
	La Lucia Ridge - Umhlanga - 4320	SLOPE DRAINAGE	Southeast	CHECKED BY:	James Harvey Ewusi

PROFILE NUMBER - 202

Depth (m)	Samples	Material Description	Soil Horizon	PHOTOS
0 – 0,5		Slightly moist pale to light brown firm, fine grained, silty clay - colluvium with roots and vegetation	A	
0,6 – 1,9		Moist pale brown to brown, firm, intact silty clay with cobbles and pebbles - residual	B	
2,0				

No Manual Refusal @ 1,9m

No Groundwater in Test Pit

▶ Undisturbed Sample

● Disturbed Sample

GEO - SOL
EARTH CIVIL TESTING

Excavation Test Pit Profile

PROJECT NUMBER:	067-2114-01	TEST PIT DATE:	22/04/2021	CORDINATES - X	28° 0.737'S
PROJECT NAME:	Try Again	GEOTECHNICIAN:	SJ - NM - ZB	CORDINATES - Y	30° 5.992'E
CLIENT:	Sivest	EXCAVATION ME	Manual Excavation	ELEVATION - Z-	1367m
ADDRESS:	4 Pencarrow Crescer	TOTAL DEPTH:	1,8m	LOGGED BY:	Nilesh Mahadew
	La Lucia Ridge - Umhlanga - 4320	SLOPE DRAINAGE	Southeast	CHECKED BY:	James Harvey Ewusi

PROFILE NUMBER - 203

Depth (m)	Samples	Material Description	Soil Horizon	PHOTOS
0 – 0,4		Slightly moist pale to light brown firm, fine grained, silty clay - colluvium with roots and vegetation	A	
0,5 – 1,7		Moist pale brown to dark brown, firm, intact silty clay with cobbles and pebbles - residual	B	
1,8 – 2,0				

No Manual Refusal @1.8m

No Groundwater in Test Pit

▶ Undisturbed Sample

● Disturbed Sample

GEO - SOL
EARTH CIVIL TESTING

Excavation Test Pit Profile

PROJECT NUMBER:	067-2114-01	TEST PIT DATE:	22/04/2021	CORDINATES - X	28° 0.377'S
PROJECT NAME:	Try Again	GEOTECHNICIAN:	SJ - NM - ZB	CORDINATES - Y	30° 5.643'E
CLIENT:	Sivest	EXCAVATION ME	Manual Excavation	ELEVATION - Z-	1385m
ADDRESS:	4 Pencarrow Crescer	TOTAL DEPTH:	1,9m	LOGGED BY:	Nilesh Mahadew
	La Lucia Ridge - Umhlanga - 4320	SLOPE DRAINAGE	Southeast	CHECKED BY:	James Harvey Ewusi

PROFILE NUMBER - 204

Depth (m)	Samples	Material Description	Soil Horizon	PHOTOS
0 – 0,7		Slightly moist pale to light brown firm, fine grained, silty clay - colluvium with roots and vegetation	A	
0,8 – 1,9		Moist brown to dark brown, firm, intact silty clay with cobbles and pebbles - residual	B	
2,0				

No Manual Refusal @1.9m

No Groundwater in Test Pit

▶ Undisturbed Sample

● Disturbed Sample

GEO - SOL
EARTH CIVIL TESTING

Excavation Test Pit Profile

PROJECT NUMBER:	067-2114-01	TEST PIT DATE:	22/04/2021	CORDINATES - X	28° 0.492'S
PROJECT NAME:	Try Again	GEOTECHNICIAN:	SJ - NM - ZB	CORDINATES - Y	30° 6.442'E
CLIENT:	Sivest	EXCAVATION ME	Manual Excavation	ELEVATION - Z-	1388m
ADDRESS:	4 Pencarrow Crescer	TOTAL DEPTH:	1,7m	LOGGED BY:	Nilesh Mahadew
La Lucia Ridge - Umhlanga - 4320		SLOPE DRAINAGE	Southeast	CHECKED BY:	James Harvey Ewusi

PROFILE NUMBER - 205

Depth (m)	Samples	Material Description	Soil Horizon	PHOTOS
0 – 0,4		Slightly moist orange to light brown firm, fine grained, silty clay - colluvium with roots and vegetation	A	
0,5 – 1,7	205C	Light brown to pale grey highly weathered and fractured sandstone soft rock	B	●
		Waterstrike @1.7m		
1,8 – 2,0				

No Manual Refusal @1.7m - Far End Corner Hole

Groundwater in Test Pit - 1.7mbNGL

▶ Undisturbed Sample

● Disturbed Sample

GEO - SOL
EARTH CIVIL TESTING

Excavation Test Pit Profile

PROJECT NUMBER:	067-2114-01	TEST PIT DATE:	22/04/2021	CORDINATES - X	28° 0.157'S
PROJECT NAME:	Try Again	GEOTECHNICIAN:	SJ - NM - ZB	CORDINATES - Y	30° 6.145'E
CLIENT:	Sivest	EXCAVATION ME	Manual Excavation	ELEVATION - Z-	1393m
ADDRESS:	4 Pencarrow Crescer	TOTAL DEPTH:	1,8m	LOGGED BY:	Nilesh Mahadew
	La Lucia Ridge - Umhlanga - 4320	SLOPE DRAINAGE	Southeast	CHECKED BY:	James Harvey Ewusi

PROFILE NUMBER - 206

Depth (m)	Samples	Material Description	Soil Horizon	PHOTOS
0 – 0,7		Slightly moist pale to light brown firm, fine grained, silty clay - colluvium with roots and vegetation	A	
0,8 – 1,8		Moist brown to dark brown, firm, intact silty clay with cobbles and pebbles - residual	B	
1,9 – 2,0				

No Manual Refusal @1.8m

No Groundwater in Test Pit

▶ Undisturbed Sample

● Disturbed Sample

GEO - SOL
EARTH CIVIL TESTING

Excavation Test Pit Profile

PROJECT NUMBER:	067-2114-01	TEST PIT DATE:	22/04/2021	CORDINATES - X	28° 0.431'S
PROJECT NAME:	Try Again	GEOTECHNICIAN:	SJ - NM - ZB	CORDINATES - Y	30° 6.006'E
CLIENT:	Sivest	EXCAVATION ME	Manual Excavation	ELEVATION - Z-	1384m
ADDRESS:	4 Pencarrow Crescer	TOTAL DEPTH:	1,9m	LOGGED BY:	Nilesh Mahadew
	La Lucia Ridge - Umhlanga - 4320	SLOPE DRAINAGE	Southeast	CHECKED BY:	James Harvey Ewusi

PROFILE NUMBER - 207

Depth (m)	Samples	Material Description	Soil Horizon	PHOTOS
0 – 0,6		Slightly moist pale to light brown firm, fine grained, silty clay - colluvium with roots and vegetation	A	
0,7 – 1,9		Moist brown to dark brown, firm, intact silty clay with cobbles and pebbles - residual	B	
2,0				

No Manual Refusal @1.9m

No Groundwater in Test Pit

▶ Undisturbed Sample

● Disturbed Sample

GEO - SOL
EARTH CIVIL TESTING

Excavation Test Pit Profile

PROJECT NUMBER:	067-2114-01	TEST PIT DATE:	22/04/2021	CORDINATES - X	28° 0.696'S
PROJECT NAME:	Try Again	GEOTECHNICIAN:	SJ - NM - ZB	CORDINATES - Y	30° 5.519'E
CLIENT:	Sivest	EXCAVATION ME	Manual Excavation	ELEVATION - Z-	1394m
ADDRESS:	4 Pencarrow Crescer	TOTAL DEPTH:	1,9m	LOGGED BY:	Nilesh Mahadew
	La Lucia Ridge - Umhlanga - 4320	SLOPE DRAINAGE	Southeast	CHECKED BY:	James Harvey Ewusi

PROFILE NUMBER - 208

Depth (m)	Samples	Material Description	Soil Horizon	PHOTOS
0 – 0,7		Slightly moist pale to light brown firm, fine grained, silty clay - colluvium with roots and vegetation	A	
0,8 – 1,3		Moist pale brown to orange, firm, intact silty clay with cobbles and pebbles - residual	B	
1,4 – 1,9		Brown to pale orange, completely to highly weathered, fien to medium grained, highly fractured. Soft rock - dolerite	C	

Manual Refusal @ 1.4m

No Groundwater in Test Pit

▶ Undisturbed Sample

● Disturbed Sample

GEO - SOL
EARTH CIVIL TESTING

Excavation Test Pit Profile

PROJECT NUMBER:	066-2113-01	TEST PIT DATE:	21/04/2021	CORDINATES - X	28° 2.673'S
PROJECT NAME:	Try Again	GEOTECHNICIAN:	SJ - NM - ZB	CORDINATES - Y	30° 1.954'E
CLIENT:	Sivest	EXCAVATION ME	Manual Excavation	ELEVATION - Z-	1338m
ADDRESS:	4 Pencarrow Crescer	TOTAL DEPTH:	0.6m	LOGGED BY:	Nilesh Mahadew
La Lucia Ridge - Umhlanga - 4320		SLOPE DRAINAGE	North West	CHECKED BY:	James Harvey Ewusi

PROFILE NUMBER - Percolation Test P201

Depth (m)	Samples	Material Description	Soil Horizon	PHOTOS
0 – 0,5		Slightly moist pale to light brown firm, fine grained, silty clay - colluvium with roots and vegetation		
0,6 – 2,0		Moist pale brown to orange, firm, intact silty clay with cobbles and pebbles - residual		

Percolation Test Drop After 2 Hours of Soaking - 96mm/9.6cm

No Groundwater in Test Pit

▶ Undisturbed Sample

● Disturbed Sample

Geotechnical Solutions (Pty) Ltd

EARTH CIVIL TESTING

Reg.No.- K2011/115681/01 Tax.No.- 9127/374/18/0
Radiation Control – Authority No. 2962/16/1430
106 Francis Road – P.O. Box 303 - Ladysmith – KwaZulu Natal – 3370
Web – www.geo-sol.co.za – Tel – 0715608058 – 0799100920 - Email – projects@geo-sol.co.za

DCP INVESTIGATION DATA

Test Date: 06/05/2021 DCP No. 101

Site: Durnacol Hole No. Side – TP101

No. Blows	DCP01 - Side TP101	NGL
0	1950	0
5	1820	130
10	1710	240
15	1595	355
20	1433	517
25	1393	557
30	1343	607
35	1293	657
40	1243	707
45	1173	777
50	1103	847
55	978	972
60	923	1027
65	868	1082
70	813	1137
75	758	1192
80	703	1247
85	660	1290
90	617	1333
95	574	1376
100	531	1419
105	488	1462
110	445	1505
115	413	1537
120	381	1569
125	349	1601
130	317	1633
135	285	1665
140	253	1697
145	221	1729
150	191	1759
155	176	1774
160	161	1789
165	146	1804
170	131	1819
No Refusal		

Test Date	06/05/2021	DCP No.	102
Site:	Durnacol	Hole No.	Side – TP102

No. Blows	DCP02 - Side TP102	NGL
0	1889	0
5	1794	95
10	1694	195
15	1555	334
20	1432	457
25	1352	537
30	1275	614
35	1193	696
40	1122	767
45	1055	834
50	1017	872
55	975	914
60	932	957
65	895	994
70	856	1033
75	811	1078
80	770	1119
85	684	1205
90	654	1235
95	620	1269
100	597	1292
105	575	1314
110	535	1354
115	511	1378
120	494	1395
125	474	1415
130	454	1435
135	430	1459
140	402	1487
145	355	1534
150	323	1566
155	297	1592
160	270	1619
165	245	1644
170	211	1678
175	195	1694
180	176	1713
185	158	1731
190	130	1759
No Refusal		

Test Date	06/05/2021	DCP No.	103
Site:	Durnacol	Hole No.	Side – TP103

No. Blows	DCP03 - Side TP103	NGL
0	1923	0
5	1811	112
10	1701	222
15	1586	337
20	1511	412
25	1433	490
30	1359	564
35	1284	639
40	1213	710
45	1136	787
50	1081	842
55	1024	899
60	971	952
65	916	1007
70	860	1063
75	811	1112
80	749	1174
85	694	1229
90	639	1284
95	587	1336
100	531	1392
105	473	1450
110	433	1490
115	392	1531
120	351	1572
125	310	1613
130	269	1654
135	228	1695
140	187	1736
145	165	1758
150	143	1780
155	121	1802
160	99	1824
No Refusal		

Test Date	06/05/2021	DCP No.	104
Site:	Durnacol	Hole No.	Side – TP104

No. Blows	DCP04 - Side TP104	NGL
0	1947	0
5	1836	111
10	1721	226
15	1612	335
20	1519	428
25	1429	518
30	1339	608
35	1249	698
40	1159	788
45	1069	878
50	975	972
55	881	1066
60	829	1118
65	778	1169
70	727	1220
75	676	1271
80	625	1322
85	574	1373
90	523	1424
95	472	1475
100	421	1526
105	368	1579
110	319	1628
115	284	1663
120	252	1695
125	232	1715
130	211	1736
135	196	1751
140	181	1766
145	166	1781
150	151	1796
155	130	1817
160	120	1827
No Refusal		

Test Date	06/05/2021	DCP No.	105
Site:	Durnacol	Hole No.	Side – TP105

No. Blows	DCP05 - Side TP105	NGL
0	1997	0
5	1874	123
10	1749	248
15	1629	368
20	1514	483
25	1404	593
30	1302	695
35	1227	770
40	1152	845
45	1077	920
50	1002	995
55	925	1072
60	859	1138
65	791	1206
70	723	1274
75	655	1342
80	589	1408
85	519	1478
90	451	1546
95	395	1602
100	340	1657
105	284	1713
110	229	1768
115	173	1824
120	138	1859
125	108	1889
130	78	1919
No Refusal		

Geotechnical Solutions (Pty) Ltd

EARTH CIVIL TESTING

Reg.No.- K2011/115681/01 Tax.No.- 9127/374/18/0
Radiation Control – Authority No. 2962/16/1430
106 Francis Road – P.O. Box 303 - Ladysmith – KwaZulu Natal – 3370
Web – www.geo-sol.co.za – Tel – 0715608058 – 0799100920 - Email – projects@geo-sol.co.za

DCP INVESTIGATION DATA

Test Date: 06/05/2021 DCP No. 201

Site: Try Again Hole No. Side – TP201

No. Blows	DCP01 - Side TP201	NGL
0	1998	0
5	1873	125
10	1763	235
15	1663	335
20	1559	439
25	1439	559
30	1378	620
35	1303	695
40	1223	775
45	1163	835
50	1093	905
55	1033	965
60	978	1020
65	928	1070
70	878	1120
75	813	1185
80	765	1233
85	720	1278
90	675	1323
95	630	1368
100	585	1413
105	540	1458
110	495	1503
115	450	1548
120	415	1583
125	385	1613
130	360	1638
135	335	1663
140	310	1688
145	285	1713
150	265	1733
155	250	1748
160	210	1788
165	175	1823
170	131	1867
No Refusal		

Test Date	06/05/2021	DCP No.	202
Site:	Try Again	Hole No.	Side – TP202

No. Blows	DCP02 - Side TP202	NGL
0	1995	0
5	1870	125
10	1745	250
15	1620	375
20	1509	486
25	1398	597
30	1287	708
35	1176	819
40	1067	928
45	958	1037
50	849	1146
55	740	1255
60	631	1364
65	522	1473
70	457	1538
75	392	1603
80	350	1645
85	308	1687
90	266	1729
95	224	1771
100	182	1813
105	140	1855
110	98	1897
No Refusal		

Test Date	06/05/2021	DCP No.	203
Site:	Try Again	Hole No.	Side – TP203

No. Blows	DCP03 - Side TP203	NGL
0	1993	0
5	1876	117
10	1759	234
15	1642	351
20	1522	471
25	1436	557
30	1347	646
35	1258	735
40	1169	824
45	1080	913
50	991	1002
55	902	1091
60	813	1180
65	724	1269
70	635	1358
75	580	1413
80	525	1468
85	470	1523
90	415	1578
95	382	1611
100	349	1644
105	316	1677
110	283	1710
115	250	1743
120	217	1776
125	184	1809
130	151	1842
135	118	1875
No Refusal		

Test Date	06/05/2021	DCP No.	204
Site:	Try Again	Hole No.	Side – TP204

No. Blows	DCP04 - Side TP204	NGL
0	1897	0
5	1790	107
10	1695	202
15	1594	303
20	1493	404
25	1392	505
30	1291	606
35	1187	710
40	1095	802
45	1007	890
50	919	978
55	831	1066
60	743	1154
65	655	1242
70	620	1277
75	585	1312
80	550	1347
85	515	1382
90	480	1417
95	445	1452
100	410	1487
105	375	1522
110	340	1557
115	305	1592
120	270	1627
125	235	1662
130	200	1697
135	163	1734
140	144	1753
145	104	1793
No Refusal		

Test Date	06/05/2021	DCP No.	205
Site:	Try Again	Hole No.	Side – TP205

No. Blows	DCP05 - Side TP205	NGL
0	1985	0
5	1878	107
10	1771	214
15	1664	321
20	1557	428
25	1450	535
30	1343	642
35	1236	749
40	1129	856
45	1022	963
50	915	1070
55	829	1156
60	746	1239
65	663	1322
70	580	1405
75	535	1450
80	490	1495
85	445	1540
90	400	1585
95	335	1650
100	310	1675
105	265	1720
110	220	1765
115	175	1810
120	135	1850
125	95	1890
No Refusal		

Test Date	06/05/2021	DCP No.	206
Site:	Try Again	Hole No.	Side – TP206

No. Blows	DCP06 - Side TP206	NGL
0	1993	0
5	1890	103
10	1791	202
15	1692	301
20	1593	400
25	1494	499
30	1395	598
35	1296	697
40	1197	796
45	1098	895
50	999	994
55	900	1093
60	844	1149
65	791	1202
70	738	1255
75	685	1308
80	632	1361
85	597	1396
90	526	1467
95	473	1520
100	420	1573
105	379	1614
110	338	1655
115	297	1696
120	256	1737
125	174	1819
130	133	1860
135	92	1901

Test Date	06/05/2021	DCP No.	207
Site:	Try Again	Hole No.	Side – TP207

No. Blows	DCP07 - Side TP207	NGL
0	1949	0
5	1850	99
10	1751	198
15	1652	297
20	1553	396
25	1454	495
30	1355	594
35	1256	693
40	1157	792
45	1058	891
50	959	990
55	860	1089
60	788	1161
65	718	1231
70	648	1301
75	573	1376
80	511	1438
85	446	1503
90	385	1564
95	344	1605
100	303	1646
105	262	1687
110	221	1728
115	180	1769
120	139	1810
125	98	1851
No Refusal		

Test Date	06/05/2021	DCP No.	208
Site:	Try Again	Hole No.	Side – TP208

No. Blows	DCP08 - Side TP208	NGL
0	1979	0
5	1878	101
10	1777	202
15	1676	303
20	1575	404
25	1474	505
30	1373	606
35	1272	707
40	1172	807
45	1070	909
50	969	1010
55	893	1086
60	817	1162
65	741	1238
70	665	1314
75	589	1390
80	513	1466
85	439	1540
90	361	1618
95	285	1694
100	209	1770
105	164	1815
110	119	1860
115	74	1905
No Refusal		

Geotechnical Solutions (Pty) Ltd

EARTH CIVIL TESTING

Reg.No.- K2011/115681/01 Tax.No.- 9127/374/18/0
Radiation Control – Authority No. 2962/16/1430
106 Francis Road – P.O. Box 303 - Ladysmith – KwaZulu Natal – 3370
Web – www.geo-sol.co.za – Tel – 0715608058 – 0799100920 - Email – projects@geo-sol.co.za

Date	10/05/2021	**Client**	Sivest	**Sample No.**	101 A
WN	2113-01	**Project**	Durancol Cemetery	**Depth**	0,8-1,2m
LN	L01-MN01	**Description**	Pale Br to Orange Silty Clay	**Lab Tech**	S. July

Soil Grading Analysis - Mechanical Analysis - SANS 3001 – GR1

Sieve Analysis	Mass Ret	% Ret	% Passing	% Sample Content	
37,500	0	0	100	**Gravel**	1,4
26,500	0	0	100	**Sand**	12,8
19,000	0	0	100	**Fines**	85,8
13,200	0	0	100	**Total**	100,0
4,750	7	1,4	98,6		
2,000	3	0,6	98	**Soil Mortar Grading**	
0,425	18	3,6	94,4	**Coarse Sand**	3,7
0,250	12	2,4	92	**Coarse Fine Sand**	2,4
0,150	15	3	89	**Medium Fine Sand**	3,1
0,075	16	3,2	85,8	**Fine Fine Sand**	3,3
<0,075	429	85,8	0	**Silt & Clay**	87,6
Total	**500**			**Total**	100,0

Natural Moisture Content

Container No. 7	**Container + Sample (Wet)**		660
Dry Sample: 500g	**Container + Sample (Dry)**		638
Container Weight 160g - Mass recorded in grams		**Moisture %**	3,3

Plasticity Atterberg Limits – SANS 3001 – GR1 – GR12

Sample Number	Moisture Content		Plastic Limit		Calculation	
Trough Number	1	2	3	4	**L.L**	40,6
Mass of container	17,6	17,3	17,3	17,2	**P.L**	30,1
Mass Container +Wet	18,7	19,6	19,3	19,5	**P.I**	10,4
Mass Container + Dry	18,3	19,1	18,9	18,9		
Mass of Dry Material	0,75	1,8	1,6	1,7		
Mass of Moisture	0,4	0,5	0,4	0,6		
% Moisture	53,3	27,8	25,0	35,3		
Shrinkage (mm)	8	**Linear Shrinkage = _x(f)**			5,3	**%**
Trough No.	1	**(f= 0.579)**				
Classification	**Unified**		OL - Organic Silt - Oraganic Clay			

For Geotechnical Solutions Pty Ltd:

(Technical Signatory – Nilesh Mahadew)

Geotechnical Solutions (Pty) Ltd

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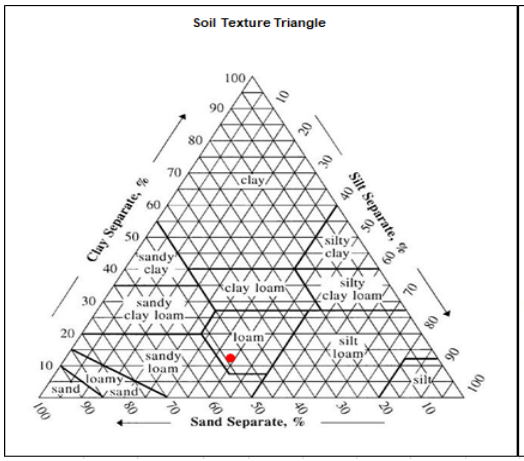
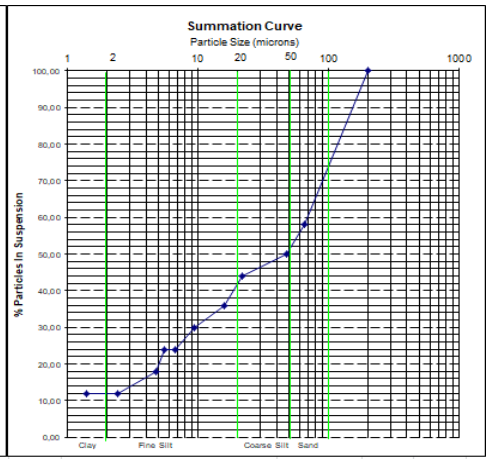
Date	10/05/2021	Client	Sivest	Sample No.	101 A
WN	2113-01	Project	Durancol Cemetery	Depth	0,8-1,2m
LN	L01-MN01	Description	Pale Br to Orange Silty Clay	Lab Tech	S. July

Hydrometer Analysis - (ASTM D422)

Elapsed Time (min)	Time	Hydrometer Reading R	Temp °C
0	8:00:00 AM		
0,5	8:00:30 AM	29	20
1	8:01:00 AM	25	20
5	8:05:00 AM	22	20
10	8:10:00 AM	18	20
30	8:30:00 AM	15	20
60	9:00:00 AM	12	20
90	9:30:00 AM	12	20
120	10:00:00 AM	9	21
480	4:00:00 PM	6	21
1440	8:00:00 AM	6	21

Elapsed Time (min)	R	C (Corrected R)	P	t^0.5	Theta	Effective Diameter	Viscosity	Density
0			100,00	0,000		200		
0,5	29	29	58,00	0,707	46,83403778	66,2333	0,010232925	1,001351452
1	25	25	50,00	1,000	48,14634885	48,1463	0,010232925	1,001351452
5	22	22	44,00	2,236	49,10757342	21,9616	0,010232925	1,001351452
10	18	18	36,00	3,162	50,36067493	15,9254	0,010232925	1,001351452
30	15	15	30,00	5,477	51,2804099	9,3625	0,010232925	1,001351452
60	12	12	24,00	7,746	52,18393717	6,7369	0,010232925	1,001351452
90	12	12	24,00	9,487	52,18393717	5,5007	0,010232925	1,001351452
120	9	9	18,00	10,954	52,44080866	4,7872	0,009992224	1,001139186
480	6	6	12,00	21,909	53,30394545	2,4330	0,009992224	1,001139186
1440	6	6	12,00	37,947	53,30394545	1,4047	0,009992224	1,001139186





For Geotechnical Solutions Pty Ltd:

(Technical Signatory – Nilesh Mahadew)

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Date	10/05/2021	**Client**	Sivest	**Sample No.**	105 B
WN	2113-01	**Project**	Durancol Cemetery	**Depth**	1,0-1,4m
LN	L01-MN01	**Description**	Pale Br to Brown Silty Clay	**Lab Tech**	S. July

Soil Grading Analysis - Mechanical Analysis - SANS 3001 – GR1

Sieve Analysis	Mass Ret	% Ret	% Passing	% Sample Content	
37,500	0	0	100	**Gravel**	0,0
26,500	0	0	100	**Sand**	16,0
19,000	0	0	100	**Fines**	84,0
13,200	0	0	100	**Total**	100,0
4,750	0	0	100		
2,000	7	1,4	98,6	**Soil Mortar Grading**	
0,425	22	4,4	94,2	**Coarse Sand**	4,5
0,250	15	3	91,2	**Coarse Fine Sand**	3,0
0,150	18	3,6	87,6	**Medium Fine Sand**	3,7
0,075	18	3,6	84	**Fine Fine Sand**	3,7
<0,075	420	84	0	**Silt & Clay**	85,2
Total	**500**			**Total**	100,0

Natural Moisture Content

Container No. 7	**Container + Sample (Wet)**		660
Dry Sample: 500g	**Container + Sample (Dry)**		637
Container Weight 160g - Mass recorded in grams		**Moisture %**	3,5

Plasticity Atterberg Limits – SANS 3001 – GR1 – GR12

Sample Number	Moisture Content		Plastic Limit		Calculation	
Trough Number	5	6	7	8	**L.L**	42,2
Mass of container	17,7	17,7	18,0	17,6	**P.L**	30,1
Mass Container +Wet	19,1	19,0	19,2	19,4	**P.I**	12,1
Mass Container + Dry	18,7	18,6	18,9	19,0		
Mass of Dry Material	1	0,9	0,95	1,4		
Mass of Moisture	0,4	0,4	0,3	0,4		
% Moisture	40	44,4	31,6	28,6		
Shrinkage (mm)	9	**Linear Shrinkage = _x(f)**			6,0	**%**
Trough No.	2	**(f= 0.579)**				
Classification	**Unified**		OL - Organic Silt - Oraganic Clay			

For Geotechnical Solutions Pty Ltd:

(Technical Signatory – Nilesh Mahadew)

Geotechnical Solutions (Pty) Ltd

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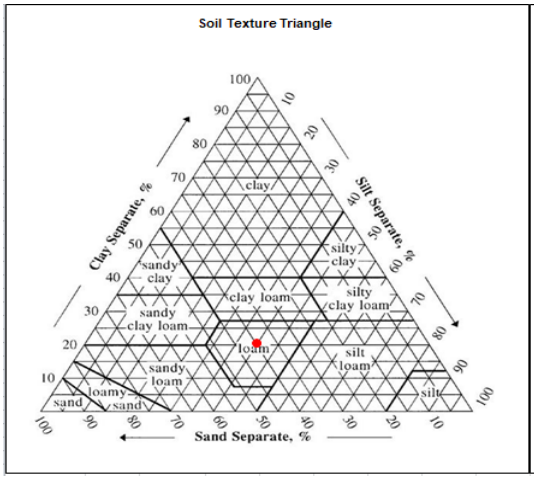
Web – www.geo-sol.co.za – Tel – 0715608058 – 0799100920 - Email – projects@geo-sol.co.za

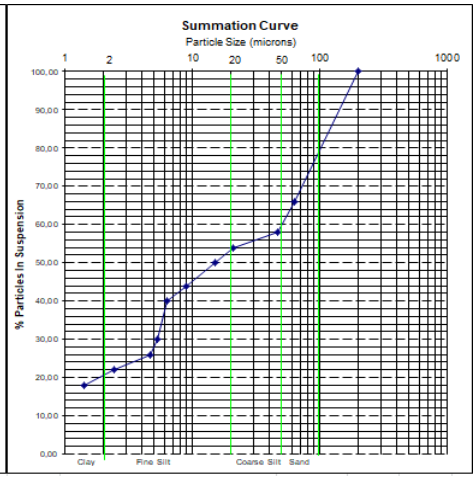
Date	10/05/2021	Client	Sivest	Sample No.	105 B
WN	2113-01	Project	Durancol Cemetery	Depth	1,0-1,4m
LN	L01-MN01	Description	Pale Br to Brown Silty Clay	Lab Tech	S. July

Hydrometer Analysis - (ASTM D422)

Elapsed Time (min)	Time	Hydrometer Reading R	Temp °C
0	8:00:00 AM		
0,5	8:00:30 AM	33	21
1	8:01:00 AM	29	21
5	8:05:00 AM	27	21
10	8:10:00 AM	25	21
30	8:30:00 AM	22	21
60	9:00:00 AM	20	21
90	9:30:00 AM	15	21
120	10:00:00 AM	13	21
480	4:00:00 PM	11	19
1440	8:00:00 AM	9	19

Elapsed Time (min)	R	C (Corrected R)	P	t^0.5	Theta	Effective Diameter	Viscosity	Density
0			100,00	0,000		200		
0,5	33	33	66,00	0,707	44,94286281	63,5588	0,009992224	1,001139186
1	29	29	58,00	1,000	46,27696151	46,2770	0,009992224	1,001139186
5	27	27	54,00	2,236	46,92979109	20,9876	0,009992224	1,001139186
10	25	25	50,00	3,162	47,57366305	15,0441	0,009992224	1,001139186
30	22	22	44,00	5,477	48,52345415	8,8591	0,009992224	1,001139186
60	20	20	40,00	7,746	49,14645183	6,3448	0,009992224	1,001139186
90	15	15	30,00	9,487	50,67044542	5,3411	0,009992224	1,001139186
120	13	13	26,00	10,954	51,26735964	4,6800	0,009992224	1,001139186
480	11	11	22,00	21,909	53,18729849	2,4277	0,010508663	1,001553186
1440	9	9	18,00	37,947	53,78566531	1,4174	0,010508663	1,001553186





For Geotechnical Solutions Pty Ltd:

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Date	10/05/2021	**Client**	Sivest	**Sample No.**	205 C
WN	2114-01	**Project**	Try Again Cemetery	**Depth**	1,1-1,5m
LN	L01-MN01	**Description**	Dark to Pale Or Silty Clay	**Lab Tech**	S. July

Soil Grading Analysis - Mechanical Analysis - SANS 3001 – GR1

	Sieve Analysis	**Mass Ret**	**% Ret**	**% Passing**	**% Sample Content**	
	37,500	0	0	100	**Gravel**	0,6
	26,500	0	0	100	**Sand**	39,4
	19,000	0	0	100	**Fines**	60,0
	13,200	0	0	100	**Total**	100,0
	4,750	3	0,6	99,4		
	2,000	9	1,8	97,6	**Soil Mortar Grading**	
	0,425	70	14	83,6	**Coarse Sand**	14,3
	0,250	51	10,2	73,4	**Coarse Fine Sand**	10,5
	0,150	39	7,8	65,6	**Medium Fine Sand**	8,0
	0,075	28	5,6	60	**Fine Fine Sand**	5,7
	<0,075	300	60	0	**Silt & Clay**	61,5
	Total	**500**			**Total**	100,0

Natural Moisture Content

Container No. 7	**Container + Sample (Wet)**		660
Dry Sample: 500g	**Container + Sample (Dry)**		642
Container Weight 160g - Mass recorded in grams		**Moisture %**	2,7

Plasticity Atterberg Limits – SANS 3001 – GR1 – GR12

Sample Number	**Moisture Content**		**Plastic Limit**		**Calculation**	
Trough Number	9	10	11	12	**L.L**	30,6
Mass of container	17,5	17,2	17,1	17,1	**P.L**	21,1
Mass Container +Wet	18,9	18,8	19,3	18,9	**P.I**	9,5
Mass Container + Dry	18,5	18,5	18,9	18,6		
Mass of Dry Material	1,05	1,3	1,8	1,5		
Mass of Moisture	0,4	0,3	0,4	0,3		
% Moisture	38,1	23,1	22,2	20		
Shrinkage (mm)	7	**Linear Shrinkage = _x(f)**			4,7	**%**
Trough No.	3	**(f= 0.579)**				
Classification	**Unified**		OL - Organic Silt - Oraganic Clay			

For Geotechnical Solutions Pty Ltd:

(Technical Signatory – Nilesh Mahadew)

Results in this report relate only to the samples as taken, and the condition received by the laboratory.

Geotechnical Solutions (Pty) Ltd

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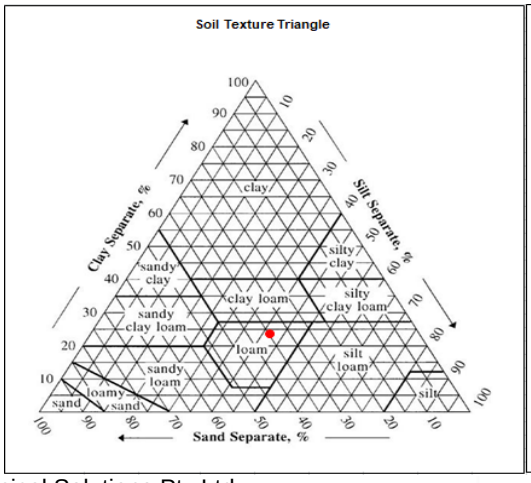
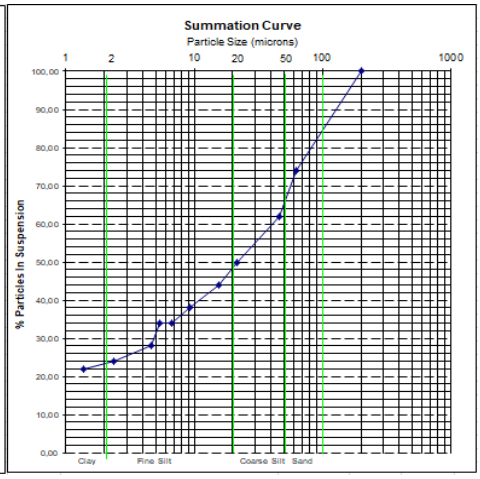
Date	10/05/2021	Client	Sivest	Sample No.	205 C
WN	2114-01	Project	Try Again Cemetery	Depth	1,1-1,5m
LN	L01-MN01	Description	Dark to Pale Or Silty Clay	Lab Tech	S. July

Hydrometer Analysis - (ASTM D422)

Elapsed Time (min)	Time	Hydrometer Reading R	Temp °C
0	8:00:00 AM		
0,5	8:00:30 AM	37	20
1	8:01:00 AM	31	20
5	8:05:00 AM	25	20
10	8:10:00 AM	22	20
30	8:30:00 AM	19	19
60	9:00:00 AM	17	19
90	9:30:00 AM	17	19
120	10:00:00 AM	14	21
480	4:00:00 PM	12	20
1440	8:00:00 AM	11	20

Elapsed Time (min)	R	C (Corrected R)	P	t^0.5	Theta	Effective Diameter	Viscosity	Density
0			100,00	0,000		200		
0,5	37	37	74,00	0,707	44,09239695	62,3561	0,010232925	1,001351452
1	31	31	62,00	1,000	46,16389486	46,1639	0,010232925	1,001351452
5	25	25	50,00	2,236	48,14634885	21,5317	0,010232925	1,001351452
10	22	22	44,00	3,162	49,10757342	15,5292	0,010232925	1,001351452
30	19	19	38,00	5,477	50,72329283	9,2608	0,010508663	1,001553186
60	17	17	34,00	7,746	51,35037981	6,6293	0,010508663	1,001553186
90	17	17	34,00	9,487	51,35037981	5,4128	0,010508663	1,001553186
120	14	14	28,00	10,954	50,96977635	4,6529	0,009992224	1,001139186
480	12	12	24,00	21,909	52,18393717	2,3819	0,010232925	1,001351452
1440	11	11	22,00	37,947	52,48165634	1,3830	0,010232925	1,001351452





For Geotechnical Solutions Pty Ltd:

(Technical Signatory – Nilesh Mahadew)

Results in this report relate only to the samples as taken, and the condition received by the laboratory.

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REPORT TO SIVEST ON THE RESULTS OF A HYDROGEOLOGICAL INVESTIGATION FOR THE PROPOSED CEMETERY SITES AT DURNACOL AND TRY AGAIN FARMS IN DANHAUSER, KWAZULU-NATAL

066-2113-01.R02
Revision 0
18 May 2021

Compiled for:
SIVEST
4 Pencarrow Crescent,
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Umhlanga

Compiled by:

Author:	**Nishen Govender** **Pr. Sci. Nat.** **MSc Geohydrology** **PhD Candidate**
Reviewer:	**Kumendrie Naidoo** **Pr. Sci. Nat.** **MSc Mining Engineering** **PhD Candidate**

REPORT TO SIVEST ON THE RESULTS OF A HYDROGEOLOGICAL INVESTIGATION FOR THE PROPOSED CEMETERY SITES AT DURNACOL AND TRY AGAIN FARMS IN DANHAUSER, KWAZULU-NATAL

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Revision 0
18 May 2021

Prepared For:

SIVEST

Compiled by:
Nishen Govender Pr. Sci. Nat.
BSc Hon and MSc Geohydrology

Approval of Document		
Date:	**18 May 2021**	
Reference:	**066-2113-01.R01**	
Professional Name	**SACNASP No**	**Signature**
Nishen Govender Pr. Sci. Nat. MSc Geohydrology	**400138/17**	
Kumendrie Naidoo Pr. Sci. Nat. MSc Mining Engineering	**400080/2000**	

TABLE OF CONTENTS

Contents

Table of Abbreviations

begl	Below existing ground level
BH	Borehole
cm	centimetre
DCP	Dynamic Cone Penetrometer Test
E	East
GM	grading modulus
IMC	insitu moisture content
kN/m²	kilonewtons per metre square
LL	liquid limit
LS	linear shrinkage
m	metre (s)
mamsl	Metres above mean sea level
mm	millimetre
No.	number
N	North
PI	plasticity index
SANS	South African National Standards
S	South
s	second
TP	Test Pits
TLB	Tractor loader backactor
WULA	Water Use License Application

1. TERMS OF AGREEMENT AND SCOPE OF SERVICES

Geotechnical Solutions (Pty) Ltd were approached by Sivest to assist with a geotechnical and hydrogeological report for two cemetery sites in Danhauser, KwaZulu-Natal.

Following the tender process, Sivest was appointed by the local authority in the area to proceed with the Environmental Impact Assessment.

The following work has been proposed by Geotechnical Solutions:

- Hand excavated inspections pits.
- Dynamic cone penetration tests.
- Groundwater Quality Assessment.
- Geotechnical and Hydrogeological Report.

This report referenced 066-2133-01.R01 provides the results of the geotechnical and hydrogeological investigation. Included in the report with be recommendations in terms of suitability for use a cemetery site, aquifer contamination risk.

2. CODES OF PRACTICE AND STANDARDS

The services were carried out in accordance to the current level of geotechnical standards practiced by professionals in Southern Africa.

The documents referenced for use is:

- *Site Investigation Code of Practice, 1st Edition, South African Institution of Civil Engineering – Geotechnical Division, January, 2010.*

- *Dippenaar, M.A., Olivier, J., Lorentz, S., Ubomba-Jaswa, E., Abia, A.L.K., and Diamond, R.E. (2018). Environmental Risk Assessment, Monitoring and Management of Cemeteries. Water Research Commission. WRC Report No. 2449/1/18*

The nature of geotechnical engineering is such that variations in soil conditions may occur even where sites seem to be consistent. Variations from what is reported here may become evident during construction and 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 ensure that conditions at variance with those predicted do not occur and to undertake an interpretation of the facts supplied in this report.

It is possible that certain indications of ground stability, contamination, or groundwater levels were latent or otherwise not visible. Opinions are based on what was visible at the time the investigation was conducted.

3. REFERENCED INFORMATION

The following information was used for the project:

i. Kml files issued by Sivest showing the site boundaries.

ii. Council for Geosciences Geological Map Sheet "*2830 Dundee*", to a scale of 1:250 000.

iii. Department of Water and Sanitation Hydrogeological Map Sheet "2730 Vryheid", to a scale of 1:500 000.

iv. Low-resolution satellite imagery sourced from Google Earth (202).

4. INVESTIGATION ACTIVITIES

The field portion of the investigation was carried out over the period 21 April 2021 to 22 April 2021 and comprised the following:

a. Hydrogeological Mapping,
b. Hydrocensus and verification of Boreholes, and
c. Collection of groundwater samples.

4.1 Test Pitting and Profiling

DURNACOL SITE

Five test pits were excavated across the site and are designated by prefixes PN101 to PN105. The test pits were excavated using hand tools to approximate refusal/final depths in the range 1.6 metres (m) to 1.8m below existing ground level (begl).

TRY AGAIN SITE

Eight test pits were excavated across the site and are designated by prefixes PN201 to PN208. The test pits were excavated using hand tools to approximate refusal/final depths in the range 1.4 metres (m) to 1.9m below existing ground level (begl).

The test pits were profiled in accordance to the South African Geoterminology Guidelines (Brink and bruin, 2002). The test pit profiles are given in Appendix A at the end of this report.

4.2 DCP Testing

DURNACOL SITE

DCP tests were also carried out adjacent to each test pit. A total of five DCP tests were completed. The DCP tests have been designated by prefixes DCP101 to DCP105 extended to approximate refusal/final depths in the range 1.7m to 1.9m begl.

TRY AGAIN SITE

DCP tests were also carried out adjacent to each test pit. A total of eight DCP tests were completed. The DCP tests have been designated by prefixes DCP201 to DCP208 extended to approximate refusal/final depths in the range 1.7m to 1.9m begl

The DCP test results are given in Appendix B at the end of this report.

4.3 Hydrogeological Mapping, Hydrocensus and Water Sampling

A hydrocensus within a 3km radius of each site was assessed, with no boreholes identified. A 4km and 5km was then utilized and 4 boreholes were identified. There are some drainage features such as ponds/dams within close proximity to the site.

Five groundwater samples were collected from site was and submitted to Talbot Laboratories in Pietermaritzburg for testing.

The water quality results are given in Appendix C.

4.4 Percolation Test

Two percolation tests were carried out in accordance with SANS 0400 (Formerly SABS 0400, 1990). The objective of the percolation test is to determine the percolation rates through the subsoil to identify approximate permeability rates.

5. DESCRIPTION OF THE STUDY AREA

There are two proposed cemetery sites that are located approximately 5km from each other. The Durnacol site is located approximately 3.5km southwest of Dannhauser Town and Try Again Site 3.0km south east of Dannahauser town.

The latitude and longitude of the central portion of the Durnacol site is 28.04343 South and 30.03601 East.

The latitude and longitude of the central portion of the Try Again site is 28.01020 South and 30.09490 East.

Both sites comprise an open plot of land with an abundance of vegetation.

The locality of the study area is shown in Figures 1 and 2, and Figures 3 and 4 shows positions of the field test pits. Indicative view of the site is given in Photographs 1 to 3.

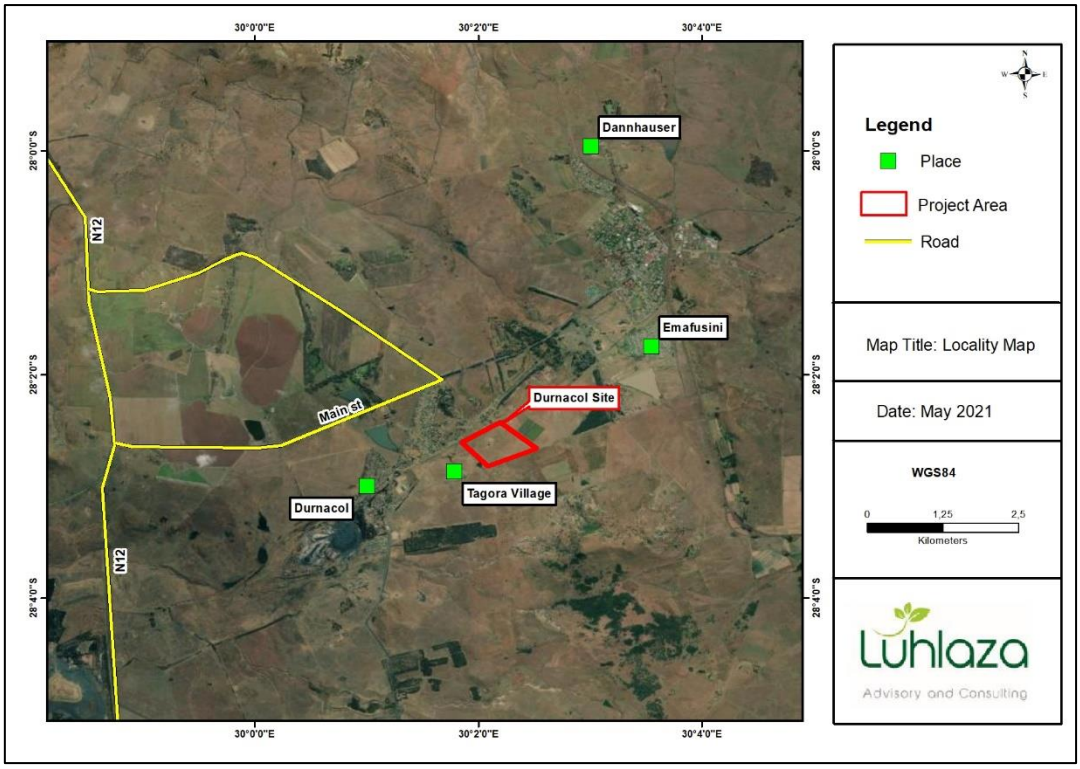

Figure 1: Locality of Durnacol Site

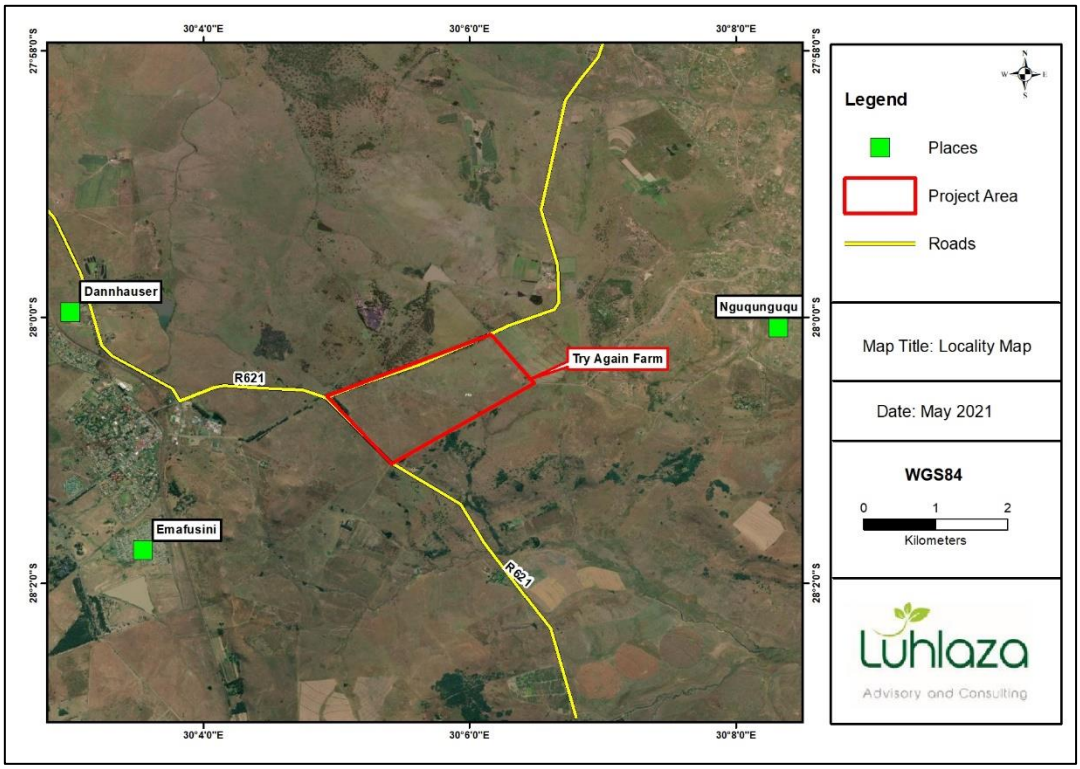

Figure 2: Locality of Try Again Site

Photograph 1: Indicative view of Durnacol Site

Photograph 2: Indicative view of Try Again Site

Photograph 3: Indicative view of the surface water feature close to Durnacol site

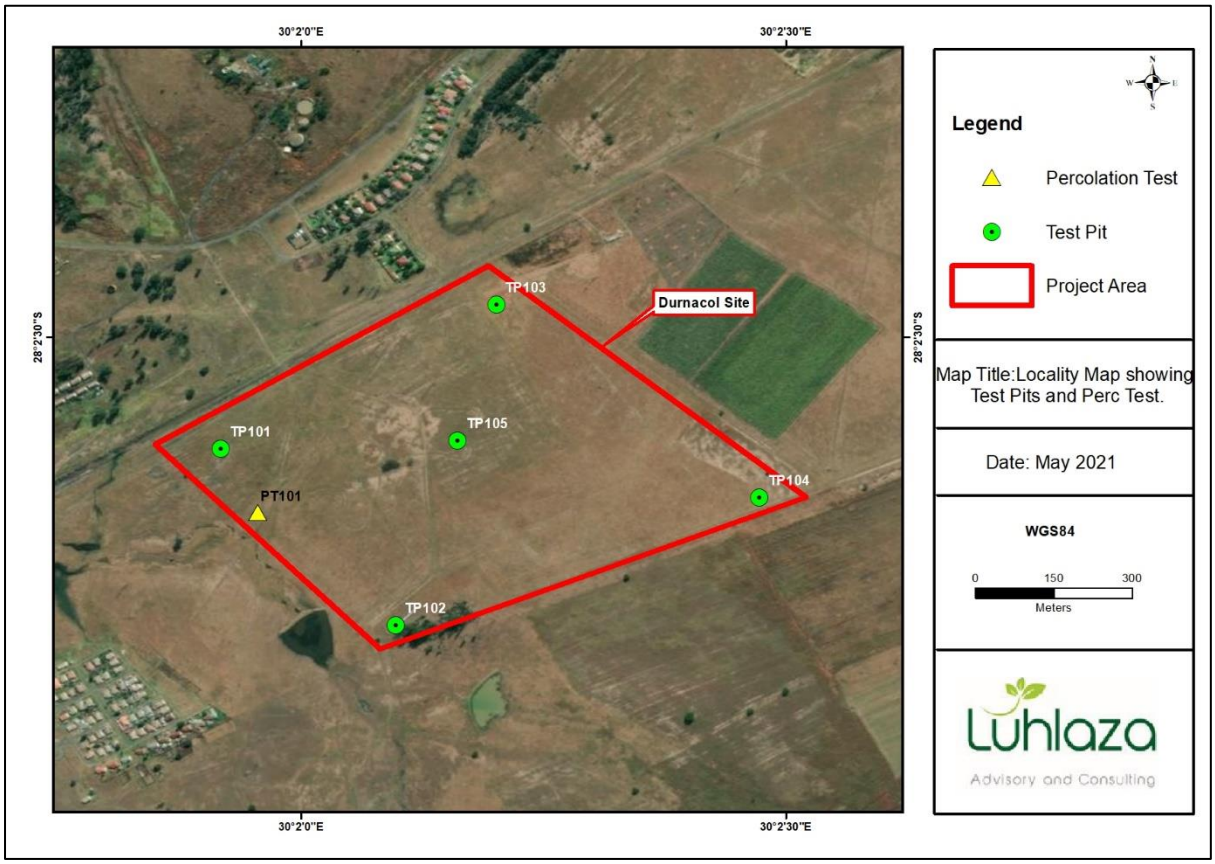

Figure 3: Field Test Positions of Durnacol Site

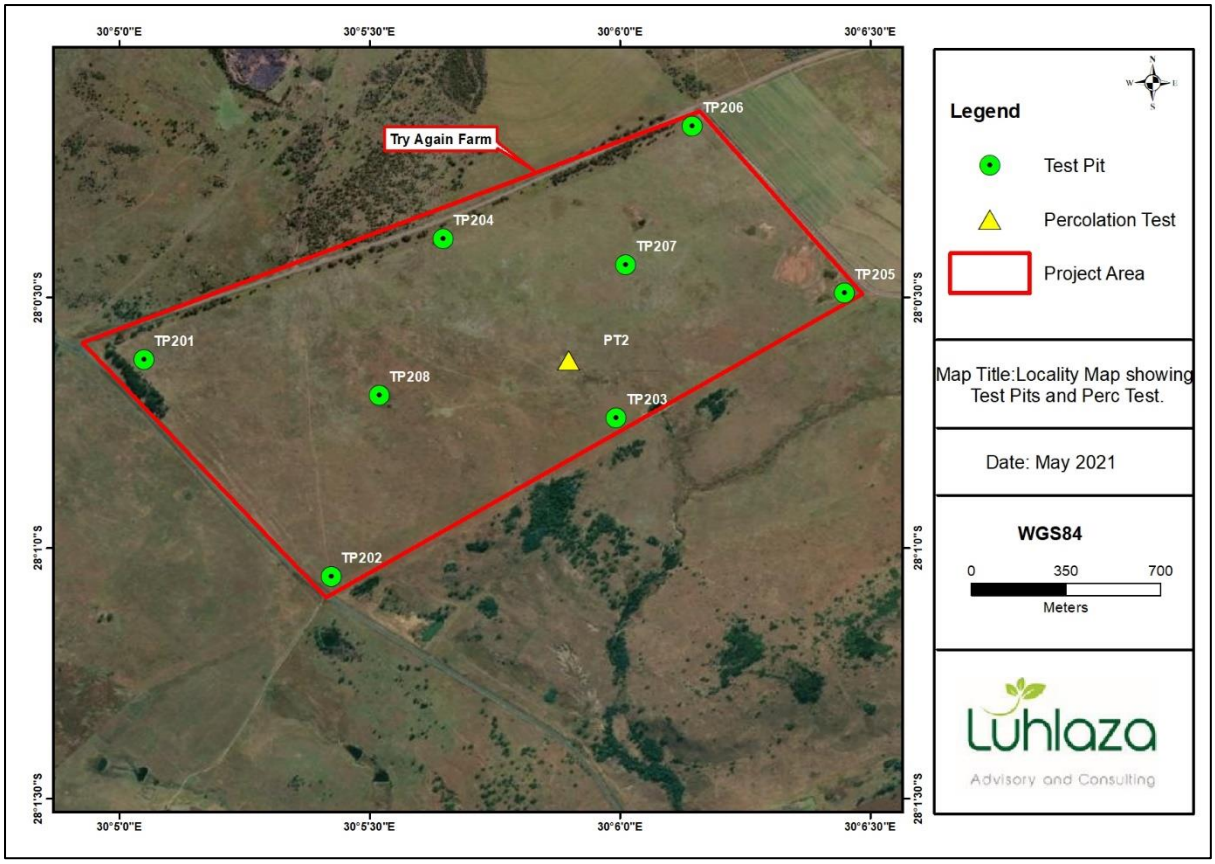

Figure 4: Field Test Positions of Try Again Site

6. CLIMATIC CONDITIONS

The area is associated with relatively hot summer months which lasts from November to March and have temperatures up to 27°C with a low of 16°C. The coldest months are from May to July and have temperatures up to 19°C and low of 4°C. April, August, September and October are relatively warm months.

The wet season is from October to March and dry season is from March to September. The wet season can expect a high of 112mm of rainfall and dry season a low of 3mm.

7. GENERAL GEOLOGY

According to the regional geological map "*2830 Dundee*" (Refer to Figures 5 and 6), the Durnacol site is underlain by Volksrust Formation shale that was intruded by Jurassic dolerite and the Try Again site is underlain by Vryheid Formation sandstone and shale that was intruded by Jurassic dolerite.

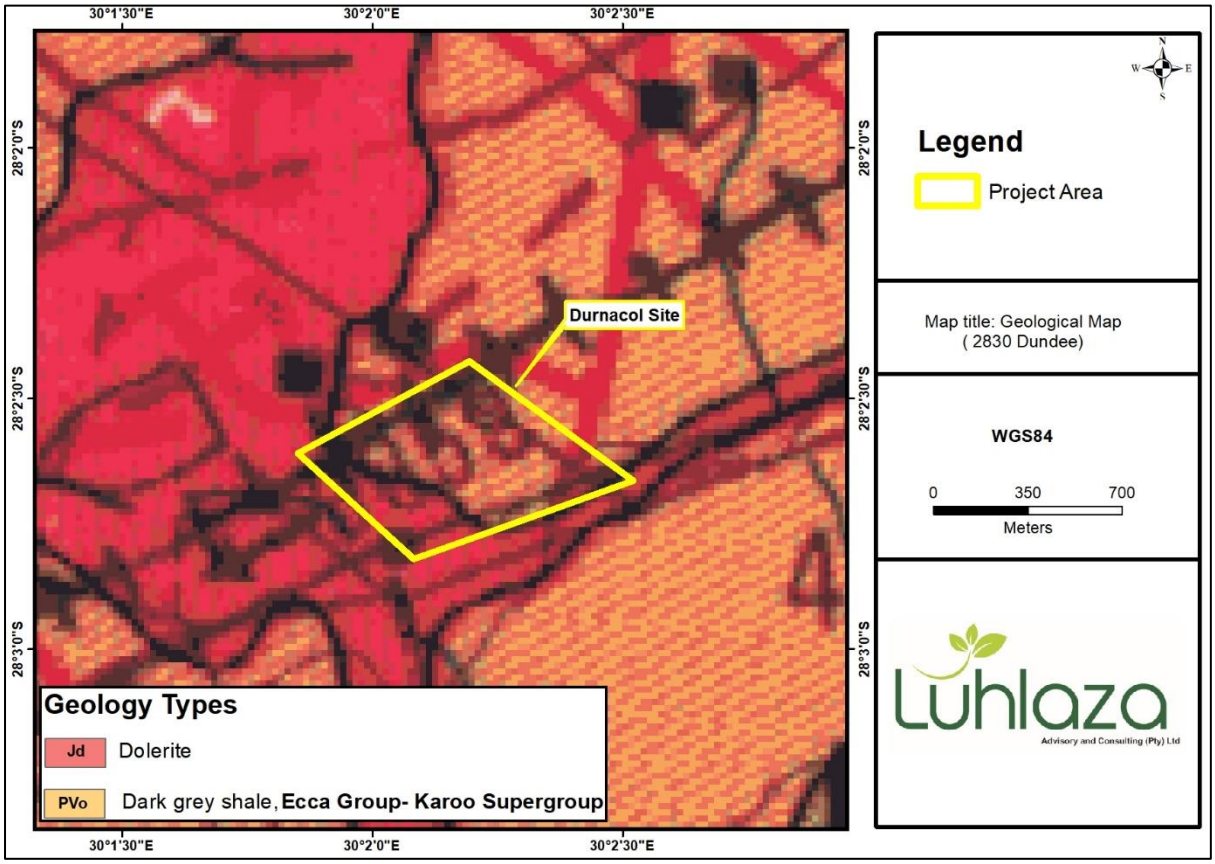

Figure 5: Geological Map of the study area "*2830*" Showing Durnacol Site

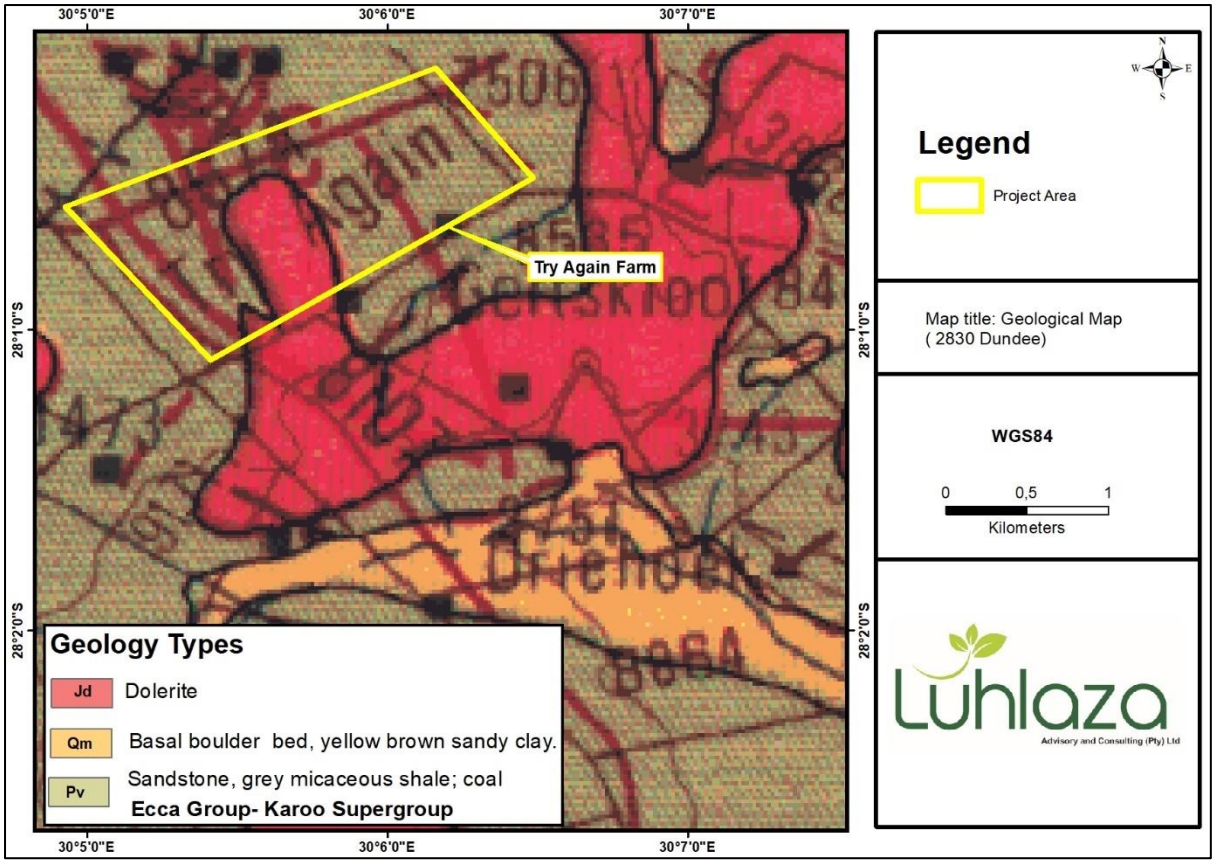

Figure 6: Geological Map of the study area "*2830*" Showing Try Again Site

7.1 Durnacol Geology

The positions investigated at the site comprised clayey colluvial and residual soils that have been derived from the underlying dolerite rock.

The **colluvial** material can be described as slightly moist, pale brown to light brown, firm, fine grained, silty CLAY with roots and vegetation. The colluvial soils extended to approximate depths in the range 0.5m to 0.7m begl (Refer to test pit profiles for exact depths).

The **residual** material can be described as moist, pale brown to orange, firm, intact, silty CLAY with cobbles and pebbles. The cobbles and pebbles appear to be from dolerite rock. The residual material extended to approximate final depth of 1.9m begl (Refer to test pit profiles for exact depths).

Weathered dolerite rock was only encountered in PN101 from an approximate depth of 1.7m begl. The dolerite rock can be described as brown to pale yellow, completely to highly weathered, fine to medium grained, highly fractured, soft rock.

Photographs of subsurface profiles observed in the inspection pits are given in Photographs 4 to 6.

Photograph 4: Material Encountered in TP101

Photograph 5: Material Encountered in TP103

Photograph 6: Material Encountered in TP105

7.2 Try Again Geology

The positions investigated at the site comprised clayey colluvial and residual soils that have been derived from the underlying sandstone rock.

The **colluvial** material can be described as slightly moist, pale brown to light brown, firm, fine grained, silty CLAY with roots and vegetation. The colluvial soils extended to approximate depths in the range 0.5m to 0.7m begl (Refer to test pit profiles for exact depths).

The **residual** material can be described as moist, pale brown to orange, firm, intact, silty CLAY with cobbles and pebbles. The cobbles and pebbles appear to be from dolerite rock. The residual material extended to approximate final depth of 1.8m begl (Refer to test pit profiles for exact depths).

Weathered dolerite rock was only encountered in PN208 from an approximate depth of 1.3m begl. The dolerite rock can be described as brown to pale yellow, completely to highly weathered, fine to medium grained, highly fractured, soft rock.

Photographs of subsurface profiles observed in the inspection pits are given in Photographs 7 to 9.

Photograph 7: Material Encountered in TP203

Photograph 8: Water Seepage and Material Encountered in TP205

Photograph 9: Material Encountered in TP207

8. HYDROGEOLOGY

8.1 General Hydrogeology of the Area

According to the Hydrogeological Map Sheet "*2730 Vryheid*" (Refer to Figures 7 and 8), the site is underlain by an Intergranular aquifer system with approximate yields in the range 0.5 to 2.0 litres/second (l/s).

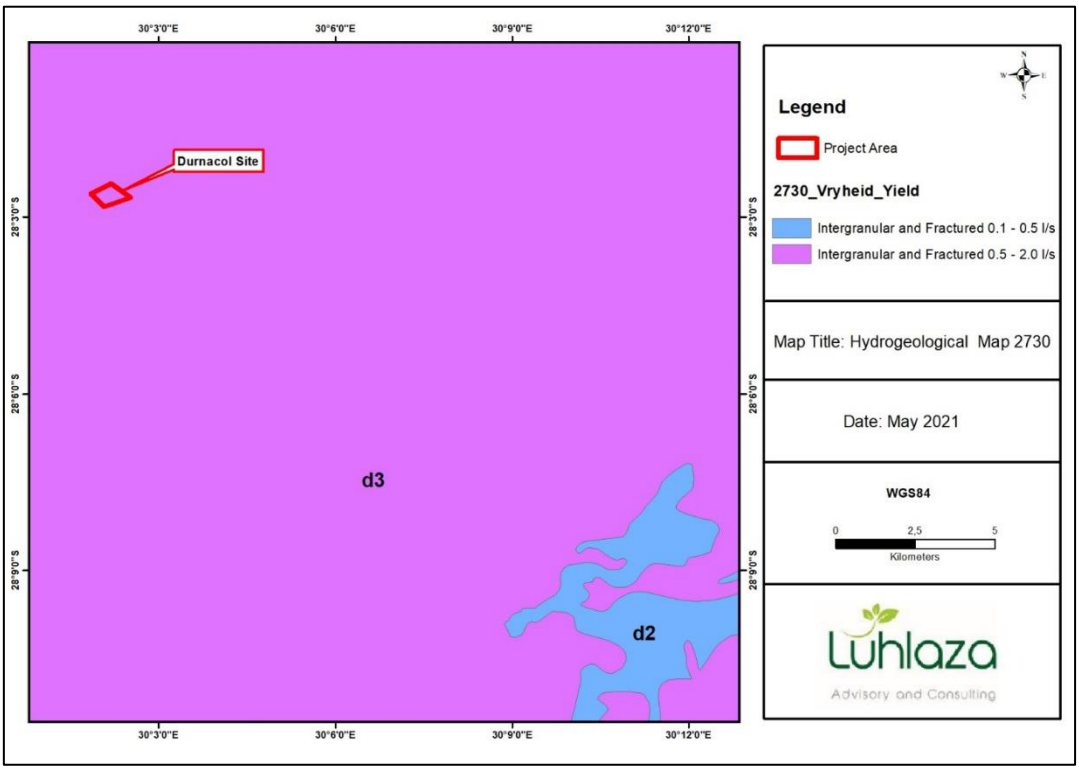

Figure 7: Hydrogeological Map of the Durnacol Site (2730 Vryheid)

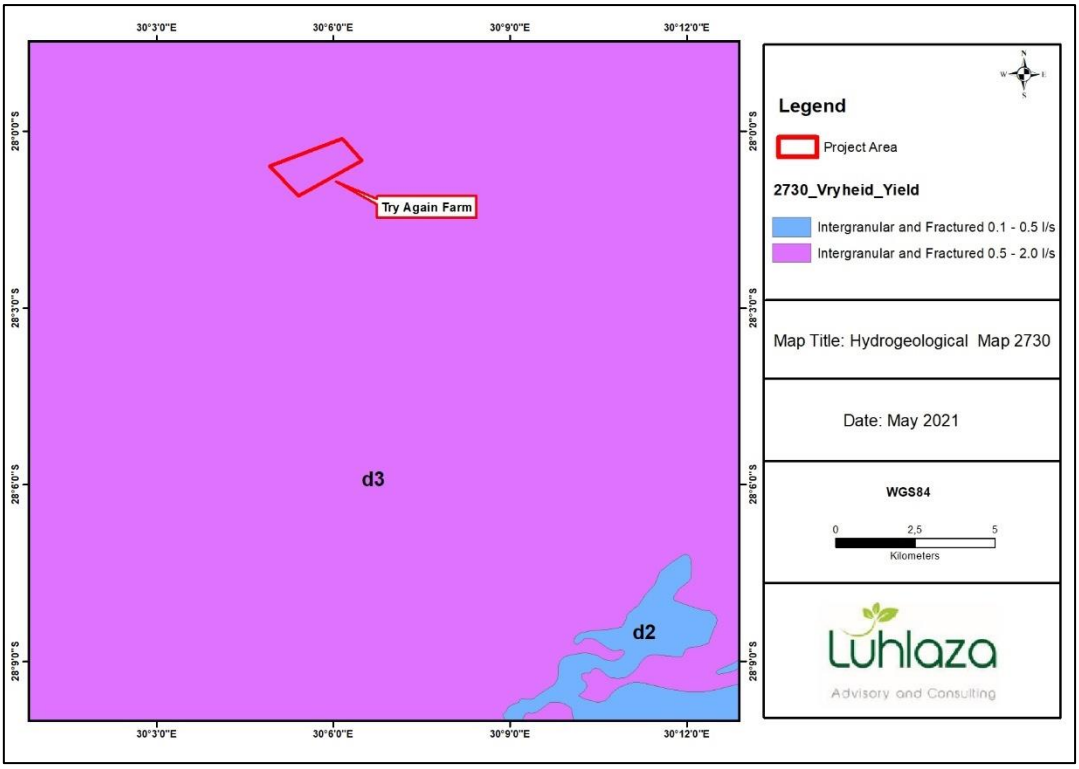

Figure 8: Hydrogeological Map of the Durnacol Site (2730 Vryheid)

According to the groundwater level map of the area, groundwater within the aquifer is anticipated to be between 10 to 25m begl as shown in Figure 9.

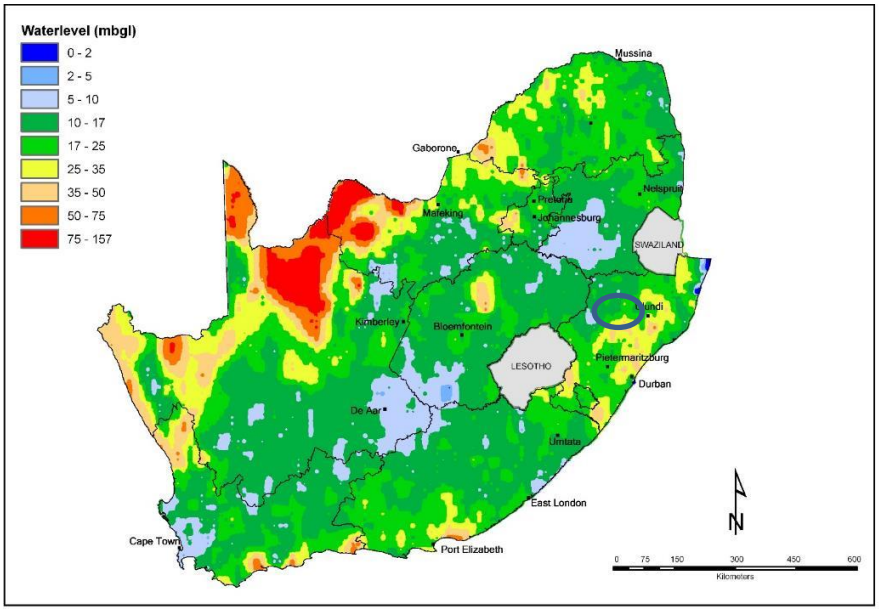

Figure 9: Groundwater Level Map of South Africa

8.2 Hydrocensus

A hydrocensus was carried out at a 4km and 5km radius as no boreholes where identified within a 3km radius. The results are shown in Table 1.

Based on the results of the hydrocensus study, the static groundwater level is between depths 0.15m and 60m begl. Based on the drilling data, the groundwater strikes was only encountered between approximate depths 66m and 82m begl. Although the static groundwater level shows groundwater close to the surface, these boreholes are within at least 4km from the site.

There was no available groundwater quality data for each borehole, however, the field team did collect a single sample from BH 2830AA00068 and BH2830AA00069, the results are discussed in the laboratory section.

Figure 10 shows the hydrocensus for the sites.

Table 1: Summary of Hydrocensus Information within 5km radius

Durnacol Site and Try Again Site with 4km to 5km Radius					
Borehole ID	**Latitude**	**Longitude**	**Water level (m begl)**	**Depth of BH (m begl)**	**Water Strike Depth (m begl)**
2830AA00069	-28.01407	30.05808	15.24	92.65	82.29
2830AA00068	-28.01406	30.05807	60.96	104.85	66.14
KZN100030	-28.04613	30.12727	0.15	51.00	
KZN100031	-28.04468	30.10614	16.50	52.00	

Photograph 10: View of BH 2830AA00068

Photograph 11: View of BH 2830AA00069

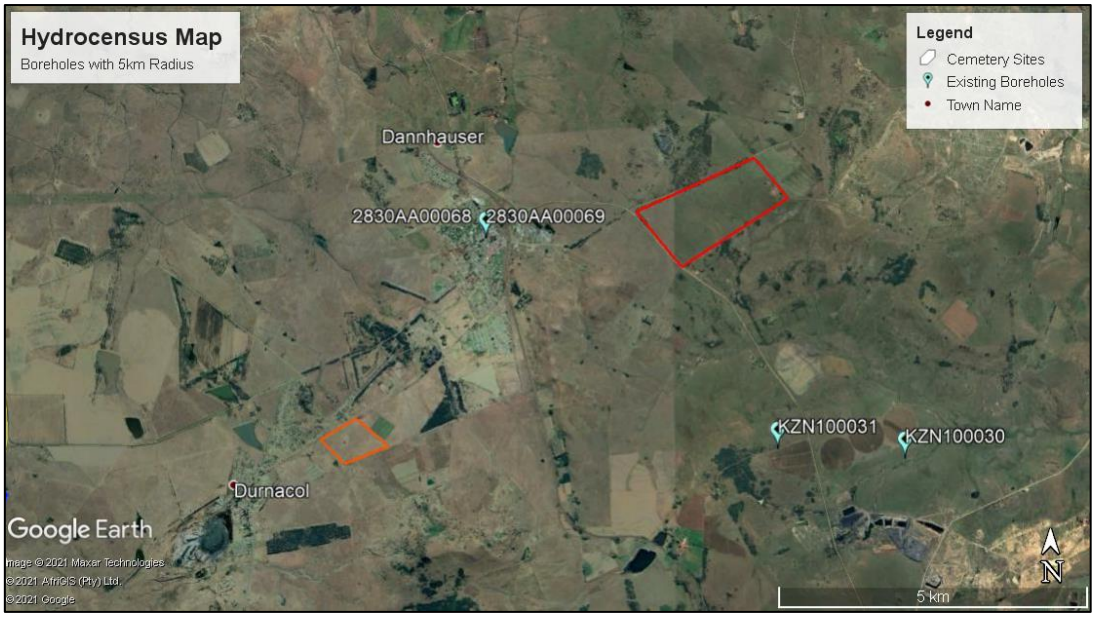

Figure 10: Hydrocensus within a 5km radius

9. GROUNDWATER SEEPAGE IN TEST PITS

Majority of the test pits did not encounter groundwater seepage. Moderate groundwater seepage was only encountered in TP205 at a depth of approximately 1.7m begl. This could pose a risk for the cemetery site as it could lead to saturated grave sites.

It must be noted that groundwater activity is, however, generally expected across the entire site on an intermittent / periodic basis and is also likely to fluctuate as a result of seasonal rainfall patterns.

There is a possibility for an elevated groundwater condition, particularly during periods of rainfall.

10. WATER LABORATORY RESULTS

The results of the water quality laboratory tests are attached to the end of this report and summarised in Table 2.

Table 2: Summary of Water Quality Result

Determinants	Units	SANS 241	BH3830 AA00068	BH3830 AA00069	TP205	WS01	WS04
Calcium	mg/l	-	90	61	-	-	-
Magnesium	mg/l	-	40	35	-	-	-
Sodium	mg/l	<200	64	30	-	-	-
Copper	mg/l	<2000	<5	<5	-	-	-
Iron	µg/l	<2000	42	6.7	<5	31	267
Manganese	µg/l	<400	242	8.6	-	-	-
Lead	µg/l	<10	<5	<5	-	-	-
Total Alkalinity	mg/l	-	279	120	-	-	-
Chloride	mg/l	<300	87	29	-	-	-
Free Chlorine	mg/l	<5	<0.1	<0.1	-	-	-
Monochloramine	mg/l	<3	<3	<3	-	-	-
Colour	mg/l	<15	<10	<10	-	-	-
Electrical Conductivity	mS/m	<170	97.7	66.9	6.0	33	5.3
Fluoride	mg/l	<1.5	0.15	0.07	-	-	-
Nitrate	mg/l	<11	<0.25	**11.5**	-	-	-
Nitrite	mg/l	<0.9	<0.05	<0.05	-	-	-
Nitrate/Nitrite Ratio		<1	<0.12	**1.1**	<0.25	<0.25	0.28
Turbidity	NTU	<5	1.2	0.92	**416**	2.5	**22**
pH		5-9.7	6.8	6.9	5.9	6.9	7.3
Sulphate	mg/l	500	65.3	115	-	-	-
Total Hardness	mg/l	17.9	389	298	12	85	17
E Coli	MPN/100ml	0	Not Detected	Not Detected	Not Detected	**22**	**63**
Total Coliforms	MPN/100ml	<10	**47**	2	-	-	-
Standard Plate Count	Colonies/ml	<1000	**2040**	**>10000**	-	-	-

These results are indicative of a baseline for the study area. Based on the laboratory results the groundwater in the area does not appear to be in a pristine condition. There is currently some contamination particularly from nitrates/nitrites and microbial organisms.

11. GROUNDWATER RISK ASSESSMENT

According to the Department of Water and Sanitation "Aquifer Classification Map" (Refer to Figure 11) for the site, the area comprises a minor aquifer system and according to the "Aquifer Vulnerability Map" (Refer to Figure 12) the area comprises a moderate vulnerability aquifer.

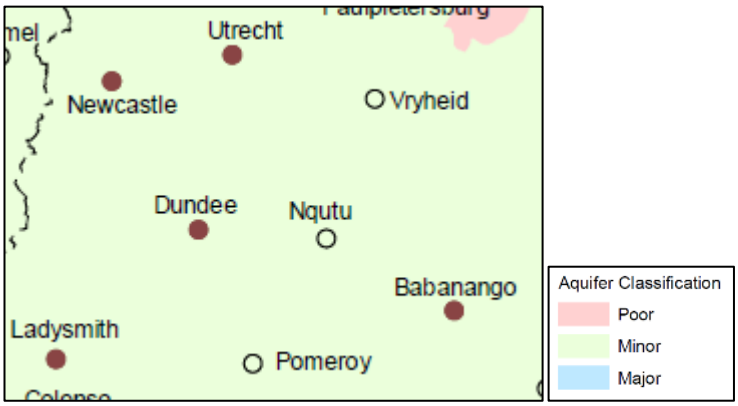

Figure 11: Aquifer Classification of the site

Table 3: Aquifer Classification System (Parsons, 1998)

Aquifer Type	Description
Sole Source Aquifer	An aquifer used to supply 50% or more of urban domestic water for a given area and for which there is no reasonably available alternative sources of water.
Major Aquifer Region	A high yielding aquifer system of good water quality.
Minor Aquifer Region	***A moderately yielding aquifer system of variable water quality.***
Poor Aquifer Region	A low to negligible yielding aquifer system of moderate to poor water quality.

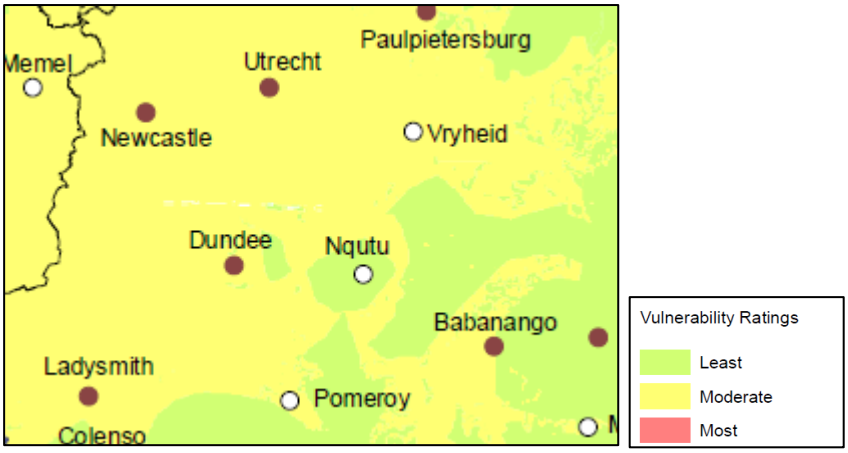

Figure 12: Aquifer Vulnerability Map of the site

The groundwater contamination assessment is based on two factors:

i. Aquifer System Management Classification and Aquifer Vulnerability Classification (Parsons, 1995); and
ii. Groundwater Quality Management (GQM) Index (Parsons, 1995).

Tables 4 and 5 show the determinants for the above aquifer classification and GQM Index.

Table 4: Aquifer System Classification and Aquifer Vulnerability Classification

Aquifer System Management Classification		Aquifer Vulnerability Classification	
Class	**Points**	**Class**	**Points**
Sole Source Aquifer System	6	High	3
Major Aquifer System	4	**Medium**	**2**
Minor Aquifer System	***2***	Low	1
Non Aquifer System	0		
Special Aquifer System	0-6		

Table 5: Groundwater Protection Level based on GQM Index

GQM Index	Level of Protection
<1	Limited Protection
1-3	Low Level Protection
3-6	***Medium Level Protection***
6-10	High Level Protection
>10	Strictly non-degradation

The aquifer in the area is considered as a minor aquifer system, therefore **2 points** are allocated and the vulnerability of the site is considered to be medium, therefore, **2 points** are allocated.

The GQM index (Table 7) is calculated by multiplying the two values to obtain a GQM value. The equation provides a result of 4 and referring to Table 7 medium level of protection is required for the site.

The most common contamination associated with cemetery sites are decompositions of corpses which produce leachate, and the chemical substances that are used in embalming process, metals and jewellery, etc.

Usually human remains comprise the following in the leachate, at least 60% of water and 30% of salts such as N, P, Cl, HCO_3, Ca, Na, metals, and 10% organic matter.

Additional contamination maybe associated with diseases from which the individual may have contracted. Table 8 below is a summary of the potential impacts of the contamination on the groundwater.

Table 6: Summary of Potential Risk for Groundwater on Site

Potential Impact and Risk:	Decomposition of Human Remains	Embalming Process	Paints, Metal Corrosion and other chemical
Nature of Impact	Negative	Negative	Negative
Duration	Medium (Few months/Years)	Short (Weeks)	Medium (Few months/Years)
Extent	Local (surrounding area)	Local (surrounding area)	Local (surrounding area)
Probability of Occurrence	Low to moderate	Low to moderate	Medium
Impact can lead to significant loss of resource	Minimal	Minimal	A degree of loss
Can the impact be reversed	Yes	Yes	Partially (Depending on contaminant)
Rating of impact pre mitigation	Low to moderate	Low	Medium to high
Can the impact be managed or mitigated	Yes	Yes	Yes
Proposed Mitigation	• Burial to be above water table • Make sure at least 3m between water table and base of burial pit • Avoid groundwater supply boreholes down gradient of cemetery site within at least 100m • Monitoring boreholes recommended for site, at least 2 down gradient from site.	• Formaldehyde is the chemical used in embalming and can breakdown to form methanol, amino acids and several other chemical. • Monitor chemicals in boreholes	• Coffin materials should be made of wood or biodegradable material. • Avoid excessive metals, plastics and paints • Jewellery, dentures, batteries, etc. should be removed prior to burial.
Impact after mitigation	Low	Low	Low

12. GROUNDWATER MONITORING RECOMMENDATIONS

It is strongly advised that groundwater monitoring boreholes be drilled. It is recommended that two boreholes be drilled downgradient of the site and a single borehole upgradient to a depth of approximately 15m.

Groundwater monitoring should be carried out on a quarterly basis and the upgradient borehole should be used as a general indicative marker. Should any

contamination occur, the downgradient boreholes in theory should reflect this in their results whilst the upgradient borehole has a baseline of the area.

The boreholes should be drilled by a reputable contractor and designed according to the current groundwater standards by the regulatory authority in the area. A hydrogeologist is recommended to supervise the drilling activity, such that, adequate information about, geology, groundwater strikes, groundwater levels, and water samples are collected.

The borehole design should comprise the following:

- Borehole adequately drilled.
- PVC Casing needs to be installed within the borehole.
- Perforated PVC Casing will need to be installed from at least 3m begl.
- The space between the PVC casing and borehole side walls need to be filled with a gravel pack.
- A bentonite seal will need to be placed on the top 3m.
- A concrete plinth at the top with a borehole marker.
- The boreholes need to be adequate diameter to allow for easy sampling.

The following parameters are recommended for testing, pH, conductivity, Potassium (K), Chloride (Cl), Nitrate (NO_3), Ammonia (NH_4), Phosphorus (P), Sodium (Na), Calcium (Ca), Carbonates (HCO_3), Iron (Fe), Manganese (Mn), Titanium (Ti), Chrome (Cr), Cadium (Cd), Lead (Pb), Nickel (Ni), Biological Oxygen Demand (BOD), Chemical Oxygen Demand (COD), Total Coliforms, and E. Coli.

It should be noted that should there be a no-go alternative site, the impacts mentioned in Table 8 will still be applicable to the current cemetery site.

13. CONCLUDING REMARKS

i. The ground conditions identified refer to the investigated positions on site.
ii. The subsurface soil profile comprises mainly clayey soils derived from the weathering of the dolerite bedrock.
iii. The depth to groundwater in the area is considered to vary and the depth is not confirmed beneath the site. Thus it is recommended that a supplementary investigation comprising boreholes be carried out to confirm this.
iv. The cemetery site has been classified according to various guidelines which take

into consideration geotechnical and groundwater parameters.

v. Geotechnically, and Hydrogeologically the Durnacol site is acceptable as a cemetery site, provided that further investigations are carried out to confirm groundwater levels.

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 may be encountered elsewhere on site.

14. REFERENCES

1) Brink, A., & Bruin, R. (2002). Guidelines for Soil and Rock Logging in South Africa. Proceedings of the Geoterminology Workshop. South Africa: Association of Engineering Geologists, South African Institute of Civil Engineering and South African Institute for Engineering and Environmental Geologists.

2) Dippenaar, M.A., Olivier, J., Lorentz, S., Ubomba-Jaswa, E., Abia, A.L.K., and Diamond, R.E. (2018). Environmental Risk Assessment, Monitoring and Management of Cemeteries. Water Research Commission. WRC Report No. 2449/1/18

3) Hall, B.M. and Hanbury, R. (1990). Some Geotechnical Considerations in the Selection of Cemetery Sites. IMIESA March 1990: 2125

4) Richards, N.P and Croukamp, L. (2004). Guidelines for Cemetery Site Selection. Preliminary Report. Council for Geosciences, Pretoria, South Africa.

5) South African Bureau of Standards. (1990). Standard Specification for Civil Engineering Construction, D: Earthworks. South Africa: South African Bureau of Standards.

GEO - SOL
EARTH CIVIL TESTING

Excavation Test Pit Profile

PROJECT NUMBER:	066-2113-01	TEST PIT DATE:	21/04/2021	CORDINATES - X	28° 2.602'S
PROJECT NAME:	Durnacol Cemetery	GEOTECHNICIAN:	SJ - NM - ZB	CORDINATES - Y	30° 1.915'E
CLIENT:	Sivest	EXCAVATION ME	Manual Excavation	ELEVATION - Z-	1341m
ADDRESS:	4 Pencarrow Crescer	TOTAL DEPTH:	1,8m	LOGGED BY:	Nilesh Mahadew
	La Lucia Ridge - Umhlanga - 4320	SLOPE DRAINAGE	North West	CHECKED BY:	James Harvey Ewusi

PROFILE NUMBER - 101

Depth (m)	Samples	Material Description	Soil Horizon	PHOTOS
0 – 0,5		Slightly moist, pale brown to light brown, fine grained, firm silty clay - colluvium	A	
0,6 – 1,7	101A	Moist pale brown to orange, firm, silty clay - residual with cobbles and pebbles	B	●
1,8 – 2,0		Brown to pale orange, completely to highly weathered, fine to medium grained, highly fractured, soft rock - Dolerite (Jurassic Age)		

Manual Refusal @1,8m

No Groundwater in Test Pit

▶ Undisturbed Sample

● Disturbed Sample

GEO - SOL
EARTH CIVIL TESTING

Excavation Test Pit Profile

PROJECT NUMBER:	066-2113-01	TEST PIT DATE:	21/04/2021	CORDINATES - X	28° 2.786'S
PROJECT NAME:	Durnacol Cemetery	GEOTECHNICIAN:	SJ - NM - ZB	CORDINATES - Y	30° 2.096'E
CLIENT:	Sivest	EXCAVATION ME	Manual Excavation	ELEVATION - Z-	1345m
ADDRESS:	4 Pencarrow Crescer	TOTAL DEPTH:	1,8m	LOGGED BY:	Nilesh Mahadew
	La Lucia Ridge - Umhlanga - 4320	SLOPE DRAINAGE	North West	CHECKED BY:	James Harvey Ewusi

PROFILE NUMBER - 102

Depth (m)	Samples	Material Description	Soil Horizon	PHOTOS
0 – 0,6		Slightly moist, pale brown to light brown, fine grained, firm silty clay - colluvium	A	
0,7 – 1,8		Moist pale brown to orange, firm, silty clay - residual with cobbles and pebbles	B	
1,9 – 2,0				

No Manual Refusal @1.8m

No Groundwater in Test Pit

▶ Undisturbed Sample

● Disturbed Sample

GEO - SOL
EARTH CIVIL TESTING

Excavation Test Pit Profile

PROJECT NUMBER:	066-2113-01	TEST PIT DATE:	21/04/2021	CORDINATES - X	28° 2.455'S
PROJECT NAME:	Durnacol Cemetery	GEOTECHNICIAN:	SJ - NM - ZB	CORDINATES - Y	30° 2.198'E
CLIENT:	Sivest	EXCAVATION ME	Manual Excavation	ELEVATION - Z-	1350m
ADDRESS:	4 Pencarrow Crescer	TOTAL DEPTH:	1,6m	LOGGED BY:	Nilesh Mahadew
La Lucia Ridge - Umhlanga - 4320		SLOPE DRAINAGE	North West	CHECKED BY:	James Harvey Ewusi

PROFILE NUMBER - 103

Depth (m)	Samples	Material Description	Soil Horizon	PHOTOS
0 – 0,5		Slightly moist, pale brown to light brown, fine grained, firm silty clay - colluvium	A	
0,6 – 1,6		Moist pale brown to dark brown, firm, silty clay - residual with cobbles and pebbles	B	
1,7 – 2,0				

No Manual Refusal @1,6m

No Groundwater in Test Pit

▶ Undisturbed Sample

● Disturbed Sample

GEO - SOL
EARTH CIVIL TESTING

Excavation Test Pit Profile

PROJECT NUMBER:	066-2113-01	TEST PIT DATE:	21/04/2021	CORDINATES - X	28° 2.657'S
PROJECT NAME:	Durnacol Cemetery	GEOTECHNICIAN:	SJ - NM - ZB	CORDINATES - Y	30° 2.475'E
CLIENT:	Sivest	EXCAVATION ME	Manual Excavation	ELEVATION - Z-	1354m
ADDRESS:	4 Pencarrow Crescer	TOTAL DEPTH:	1,8m	LOGGED BY:	Nilesh Mahadew
	La Lucia Ridge - Umhlanga - 4320	SLOPE DRAINAGE	North West	CHECKED BY:	James Harvey Ewusi

PROFILE NUMBER - 104

Depth (m)	Samples	Material Description	Soil Horizon	PHOTOS
0 – 0,4		Slightly moist, pale brown to light brown, fine grained, firm silty clay - colluvium	A	
0,5 – 1,7		Moist pale brown to dark brown, firm, silty clay - residual with cobbles and pebbles	B	
1,8 – 1,9				

No Manual Refusal @1,8m

No Groundwater in Test Pit

▶ Undisturbed Sample

● Disturbed Sample

GEO - SOL
EARTH CIVIL TESTING

Excavation Test Pit Profile

PROJECT NUMBER:	066-2113-01	TEST PIT DATE:	21/04/2021	CORDINATES - X	28° 2.598'S
PROJECT NAME:	Durnacol Cemetery	GEOTECHNICIAN:	SJ - NM - ZB	CORDINATES - Y	30° 2.158'E
CLIENT:	Sivest	EXCAVATION ME	Manual Excavation	ELEVATION - Z-	1348m
ADDRESS:	4 Pencarrow Crescer	TOTAL DEPTH:	1,8m	LOGGED BY:	Nilesh Mahadew
	La Lucia Ridge - Umhlanga - 4320	SLOPE DRAINAGE	North West	CHECKED BY:	James Harvey Ewusi

PROFILE NUMBER - 105

Depth (m)	Samples	Material Description	Soil Horizon	PHOTOS
0 – 0,6		Slightly moist, pale brown to light brown, fine grained, firm silty clay - colluvium	A	
0,7 – 1,8	105B	Moist pale brown to brown, firm, silty clay - residual with cobbles and pebbles	B	●
1,9 – 2,0				

No Manual Refusal @1,8m

No Groundwater in Test Pit

▶ Undisturbed Sample

● Disturbed Sample

GEO - SOL
EARTH CIVIL TESTING

Excavation Test Pit Profile

PROJECT NUMBER:	066-2113-01	TEST PIT DATE:	21/04/2021	CORDINATES - X	28° 2.673'S
PROJECT NAME:	Durnacol Cemetery	GEOTECHNICIAN:	SJ - NM - ZB	CORDINATES - Y	30° 1.954'E
CLIENT:	Sivest	EXCAVATION ME	Manual Excavation	ELEVATION - Z-	1338m
ADDRESS:	4 Pencarrow Crescer	TOTAL DEPTH:	0.6m	LOGGED BY:	Nilesh Mahadew
	La Lucia Ridge - Umhlanga - 4320	SLOPE DRAINAGE	North West	CHECKED BY:	James Harvey Ewusi

PROFILE NUMBER - Percolation Test P101

Depth (m)	Samples	Material Description	Soil Horizon	PHOTOS
0 – 0,5		Slightly moist, pale brown to light brown, fine grained, firm silty clay - colluvium		 
0,6 – 2,0		Moist pale brown to orange, firm, silty clay - residual with cobbles and pebbles		

Percolation Test Drop After 2 Hours of Soaking - 119mm/11.9cm

No Groundwater in Test Pit

▶ Undisturbed Sample

● Disturbed Sample

GEO - SOL
EARTH CIVIL TESTING

Excavation Test Pit Profile

PROJECT NUMBER:	067-2114-01	TEST PIT DATE:	22/04/2021	CORDINATES - X	28° 0.623'S
PROJECT NAME:	Try Again	GEOTECHNICIAN:	SJ - NM - ZB	CORDINATES - Y	30° 5.052'E
CLIENT:	Sivest	EXCAVATION ME	Manual Excavation	ELEVATION - Z-	1380m
ADDRESS:	4 Pencarrow Crescer	TOTAL DEPTH:	1,9m	LOGGED BY:	Nilesh Mahadew
	La Lucia Ridge - Umhlanga - 4320	SLOPE DRAINAGE	Southeast	CHECKED BY:	James Harvey Ewusi

PROFILE NUMBER - 201

Depth (m)	Samples	Material Description	Soil Horizon	PHOTOS
0 – 0,6		Slightly moist pale to light brown firm, fine grained, silty clay - colluvium with roots and vegetation	A	
0,7 – 1,9		Moist pale brown to orange, firm, intact silty clay with cobbles and pebbles - residual	B	
2,0				

No Manual Refusal @1,9m

No Groundwater in Test Pit

▶ Undisturbed Sample

● Disturbed Sample

GEO - SOL
EARTH CIVIL TESTING

Excavation Test Pit Profile

PROJECT NUMBER:	067-2114-01	TEST PIT DATE:	22/04/2021	CORDINATES - X	28° 1.055'S
PROJECT NAME:	Try Again	GEOTECHNICIAN:	SJ - NM - ZB	CORDINATES - Y	30° 5.423'E
CLIENT:	Sivest	EXCAVATION ME	Manual Excavation	ELEVATION - Z-	1384m
ADDRESS:	4 Pencarrow Crescer	TOTAL DEPTH:	1,9m	LOGGED BY:	Nilesh Mahadew
	La Lucia Ridge - Umhlanga - 4320	SLOPE DRAINAGE	Southeast	CHECKED BY:	James Harvey Ewusi

PROFILE NUMBER - 202

Depth (m)	Samples	Material Description	Soil Horizon	PHOTOS
0 – 0,5		Slightly moist pale to light brown firm, fine grained, silty clay - colluvium with roots and vegetation	A	
0,6 – 1,9		Moist pale brown to brown, firm, intact silty clay with cobbles and pebbles - residual	B	
2,0				

No Manual Refusal @ 1,9m

No Groundwater in Test Pit

▶ Undisturbed Sample

● Disturbed Sample

GEO - SOL
EARTH CIVIL TESTING

Excavation Test Pit Profile

PROJECT NUMBER:	067-2114-01	TEST PIT DATE:	22/04/2021	CORDINATES - X	28° 0.737'S
PROJECT NAME:	Try Again	GEOTECHNICIAN:	SJ - NM - ZB	CORDINATES - Y	30° 5.992'E
CLIENT:	Sivest	EXCAVATION ME	Manual Excavation	ELEVATION - Z-	1367m
ADDRESS:	4 Pencarrow Crescer	TOTAL DEPTH:	1,8m	LOGGED BY:	Nilesh Mahadew
	La Lucia Ridge - Umhlanga - 4320	SLOPE DRAINAGE	Southeast	CHECKED BY:	James Harvey Ewusi

PROFILE NUMBER - 203

Depth (m)	Samples	Material Description	Soil Horizon	PHOTOS
0 – 0,4		Slightly moist pale to light brown firm, fine grained, silty clay - colluvium with roots and vegetation	A	
0,5 – 1,7		Moist pale brown to dark brown, firm, intact silty clay with cobbles and pebbles - residual	B	
1,8 – 2,0				

No Manual Refusal @1.8m

No Groundwater in Test Pit

▶ Undisturbed Sample

● Disturbed Sample

GEO - SOL
EARTH CIVIL TESTING

Excavation Test Pit Profile

PROJECT NUMBER:	067-2114-01	TEST PIT DATE:	22/04/2021	CORDINATES - X	28° 0.377'S
PROJECT NAME:	Try Again	GEOTECHNICIAN:	SJ - NM - ZB	CORDINATES - Y	30° 5.643'E
CLIENT:	Sivest	EXCAVATION ME	Manual Excavation	ELEVATION - Z-	1385m
ADDRESS:	4 Pencarrow Crescer	TOTAL DEPTH:	1,9m	LOGGED BY:	Nilesh Mahadew
	La Lucia Ridge - Umhlanga - 4320	SLOPE DRAINAGE	Southeast	CHECKED BY:	James Harvey Ewusi

PROFILE NUMBER - 204

Depth (m)	Samples	Material Description	Soil Horizon	PHOTOS
0 – 0,7		Slightly moist pale to light brown firm, fine grained, silty clay - colluvium with roots and vegetation	A	
0,8 – 1,9		Moist brown to dark brown, firm, intact silty clay with cobbles and pebbles - residual	B	
2,0				

No Manual Refusal @1.9m

No Groundwater in Test Pit

▶ Undisturbed Sample

● Disturbed Sample

GEO - SOL
EARTH CIVIL TESTING

Excavation Test Pit Profile

PROJECT NUMBER:	067-2114-01	TEST PIT DATE:	22/04/2021	CORDINATES - X	28° 0.492'S
PROJECT NAME:	Try Again	GEOTECHNICIAN:	SJ - NM - ZB	CORDINATES - Y	30° 6.442'E
CLIENT:	Sivest	EXCAVATION ME	Manual Excavation	ELEVATION - Z-	1388m
ADDRESS:	4 Pencarrow Crescer	TOTAL DEPTH:	1,7m	LOGGED BY:	Nilesh Mahadew
La Lucia Ridge - Umhlanga - 4320		SLOPE DRAINAGE	Southeast	CHECKED BY:	James Harvey Ewusi

PROFILE NUMBER - 205

Depth (m)	Samples	Material Description	Soil Horizon	PHOTOS
0 – 0,4		Slightly moist orange to light brown firm, fine grained, silty clay - colluvium with roots and vegetation	A	
0,5 – 1,7	205C	Light brown to pale grey highly weathered and fractured sandstone soft rock	B	●
		Waterstrike @1.7m		
1,8 – 2,0				

No Manual Refusal @1.7m - Far End Corner Hole

Groundwater in Test Pit - 1.7mbNGL

▶ Undisturbed Sample

● Disturbed Sample

GEO - SOL
EARTH CIVIL TESTING

Excavation Test Pit Profile

PROJECT NUMBER:	067-2114-01	TEST PIT DATE:	22/04/2021	CORDINATES - X	28° 0.157'S
PROJECT NAME:	Try Again	GEOTECHNICIAN:	SJ - NM - ZB	CORDINATES - Y	30° 6.145'E
CLIENT:	Sivest	EXCAVATION ME	Manual Excavation	ELEVATION - Z-	1393m
ADDRESS:	4 Pencarrow Crescer	TOTAL DEPTH:	1,8m	LOGGED BY:	Nilesh Mahadew
	La Lucia Ridge - Umhlanga - 4320	SLOPE DRAINAGE	Southeast	CHECKED BY:	James Harvey Ewusi

PROFILE NUMBER - 206

Depth (m)	Samples	Material Description	Soil Horizon	PHOTOS
0 – 0,7		Slightly moist pale to light brown firm, fine grained, silty clay - colluvium with roots and vegetation	A	
0,8 – 1,8		Moist brown to dark brown, firm, intact silty clay with cobbles and pebbles - residual	B	
1,9 – 2,0				

No Manual Refusal @1.8m

No Groundwater in Test Pit

▶ Undisturbed Sample

● Disturbed Sample

GEO - SOL
EARTH CIVIL TESTING

Excavation Test Pit Profile

PROJECT NUMBER:	067-2114-01	TEST PIT DATE:	22/04/2021	CORDINATES - X	28° 0.431'S
PROJECT NAME:	Try Again	GEOTECHNICIAN:	SJ - NM - ZB	CORDINATES - Y	30° 6.006'E
CLIENT:	Sivest	EXCAVATION ME	Manual Excavation	ELEVATION - Z-	1384m
ADDRESS:	4 Pencarrow Crescer	TOTAL DEPTH:	1,9m	LOGGED BY:	Nilesh Mahadew
	La Lucia Ridge - Umhlanga - 4320	SLOPE DRAINAGE	Southeast	CHECKED BY:	James Harvey Ewusi

PROFILE NUMBER - 207

Depth (m)	Samples	Material Description	Soil Horizon	PHOTOS
0 – 0,6		Slightly moist pale to light brown firm, fine grained, silty clay - colluvium with roots and vegetation	A	
0,7 – 1,9		Moist brown to dark brown, firm, intact silty clay with cobbles and pebbles - residual	B	
2,0				

No Manual Refusal @1.9m

No Groundwater in Test Pit

▶ Undisturbed Sample

● Disturbed Sample

GEO - SOL
EARTH CIVIL TESTING

Excavation Test Pit Profile

PROJECT NUMBER:	067-2114-01	TEST PIT DATE:	22/04/2021	CORDINATES - X	28° 0.696'S
PROJECT NAME:	Try Again	GEOTECHNICIAN:	SJ - NM - ZB	CORDINATES - Y	30° 5.519'E
CLIENT:	Sivest	EXCAVATION ME	Manual Excavation	ELEVATION - Z-	1394m
ADDRESS:	4 Pencarrow Crescer	TOTAL DEPTH:	1,9m	LOGGED BY:	Nilesh Mahadew
	La Lucia Ridge - Umhlanga - 4320	SLOPE DRAINAGE	Southeast	CHECKED BY:	James Harvey Ewusi

PROFILE NUMBER - 208

Depth (m)	Samples	Material Description	Soil Horizon	PHOTOS
0 – 0,7		Slightly moist pale to light brown firm, fine grained, silty clay - colluvium with roots and vegetation	A	
0,8 – 1,3		Moist pale brown to orange, firm, intact silty clay with cobbles and pebbles - residual	B	
1,4 – 1,9		Brown to pale orange, completely to highly weathered, fien to medium grained, highly fractured. Soft rock - dolerite	C	

Manual Refusal @ 1.4m

No Groundwater in Test Pit

▶ Undisturbed Sample

● Disturbed Sample

GEO - SOL
EARTH CIVIL TESTING

Excavation Test Pit Profile

PROJECT NUMBER:	066-2113-01	TEST PIT DATE:	21/04/2021	CORDINATES - X	28° 2.673'S
PROJECT NAME:	Try Again	GEOTECHNICIAN:	SJ - NM - ZB	CORDINATES - Y	30° 1.954'E
CLIENT:	Sivest	EXCAVATION ME	Manual Excavation	ELEVATION - Z-	1338m
ADDRESS:	4 Pencarrow Crescer	TOTAL DEPTH:	0.6m	LOGGED BY:	Nilesh Mahadew
La Lucia Ridge - Umhlanga - 4320		SLOPE DRAINAGE	North West	CHECKED BY:	James Harvey Ewusi

PROFILE NUMBER - Percolation Test P201

Depth (m)	Samples	Material Description	Soil Horizon	PHOTOS
0 – 0,5		Slightly moist pale to light brown firm, fine grained, silty clay - colluvium with roots and vegetation		
0,6 – 2,0		Moist pale brown to orange, firm, intact silty clay with cobbles and pebbles - residual		

Percolation Test Drop After 2 Hours of Soaking - 96mm/9.6cm

No Groundwater in Test Pit

▶ Undisturbed Sample

● Disturbed Sample

Geotechnical Solutions (Pty) Ltd

EARTH CIVIL TESTING

Reg.No.- K2011/115681/01 Tax.No.- 9127/374/18/0
Radiation Control – Authority No. 2962/16/1430
106 Francis Road – P.O. Box 303 - Ladysmith – KwaZulu Natal – 3370
Web – www.geo-sol.co.za – Tel – 0715608058 – 0799100920 - Email – projects@geo-sol.co.za

DCP INVESTIGATION DATA

Test Date: 06/05/2021 DCP No. 101

Site: Durnacol Hole No. Side – TP101

No. Blows	DCP01 - Side TP101	NGL
0	1950	0
5	1820	130
10	1710	240
15	1595	355
20	1433	517
25	1393	557
30	1343	607
35	1293	657
40	1243	707
45	1173	777
50	1103	847
55	978	972
60	923	1027
65	868	1082
70	813	1137
75	758	1192
80	703	1247
85	660	1290
90	617	1333
95	574	1376
100	531	1419
105	488	1462
110	445	1505
115	413	1537
120	381	1569
125	349	1601
130	317	1633
135	285	1665
140	253	1697
145	221	1729
150	191	1759
155	176	1774
160	161	1789
165	146	1804
170	131	1819
No Refusal		

Test Date	06/05/2021	DCP No.	102
Site:	Durnacol	Hole No.	Side – TP102

No. Blows	DCP02 - Side TP102	NGL
0	1889	0
5	1794	95
10	1694	195
15	1555	334
20	1432	457
25	1352	537
30	1275	614
35	1193	696
40	1122	767
45	1055	834
50	1017	872
55	975	914
60	932	957
65	895	994
70	856	1033
75	811	1078
80	770	1119
85	684	1205
90	654	1235
95	620	1269
100	597	1292
105	575	1314
110	535	1354
115	511	1378
120	494	1395
125	474	1415
130	454	1435
135	430	1459
140	402	1487
145	355	1534
150	323	1566
155	297	1592
160	270	1619
165	245	1644
170	211	1678
175	195	1694
180	176	1713
185	158	1731
190	130	1759
No Refusal		

Test Date	06/05/2021	DCP No.	103
Site:	Durnacol	Hole No.	Side – TP103

No. Blows	DCP03 - Side TP103	NGL
0	1923	0
5	1811	112
10	1701	222
15	1586	337
20	1511	412
25	1433	490
30	1359	564
35	1284	639
40	1213	710
45	1136	787
50	1081	842
55	1024	899
60	971	952
65	916	1007
70	860	1063
75	811	1112
80	749	1174
85	694	1229
90	639	1284
95	587	1336
100	531	1392
105	473	1450
110	433	1490
115	392	1531
120	351	1572
125	310	1613
130	269	1654
135	228	1695
140	187	1736
145	165	1758
150	143	1780
155	121	1802
160	99	1824
No Refusal		

Test Date	06/05/2021	DCP No.	104
Site:	Durnacol	Hole No.	Side – TP104

No. Blows	DCP04 - Side TP104	NGL
0	1947	0
5	1836	111
10	1721	226
15	1612	335
20	1519	428
25	1429	518
30	1339	608
35	1249	698
40	1159	788
45	1069	878
50	975	972
55	881	1066
60	829	1118
65	778	1169
70	727	1220
75	676	1271
80	625	1322
85	574	1373
90	523	1424
95	472	1475
100	421	1526
105	368	1579
110	319	1628
115	284	1663
120	252	1695
125	232	1715
130	211	1736
135	196	1751
140	181	1766
145	166	1781
150	151	1796
155	130	1817
160	120	1827
No Refusal		

Test Date	06/05/2021	DCP No.	105
Site:	Durnacol	Hole No.	Side – TP105

No. Blows	DCP05 - Side TP105	NGL
0	1997	0
5	1874	123
10	1749	248
15	1629	368
20	1514	483
25	1404	593
30	1302	695
35	1227	770
40	1152	845
45	1077	920
50	1002	995
55	925	1072
60	859	1138
65	791	1206
70	723	1274
75	655	1342
80	589	1408
85	519	1478
90	451	1546
95	395	1602
100	340	1657
105	284	1713
110	229	1768
115	173	1824
120	138	1859
125	108	1889
130	78	1919
No Refusal		

Geotechnical Solutions (Pty) Ltd

EARTH CIVIL TESTING

Reg.No.- K2011/115681/01 Tax.No.- 9127/374/18/0
Radiation Control – Authority No. 2962/16/1430
106 Francis Road – P.O. Box 303 - Ladysmith – KwaZulu Natal – 3370
Web – www.geo-sol.co.za – Tel – 0715608058 – 0799100920 - Email – projects@geo-sol.co.za

DCP INVESTIGATION DATA

Test Date: 06/05/2021 DCP No. 201

Site: Try Again Hole No. Side – TP201

No. Blows	DCP01 - Side TP201	NGL
0	1998	0
5	1873	125
10	1763	235
15	1663	335
20	1559	439
25	1439	559
30	1378	620
35	1303	695
40	1223	775
45	1163	835
50	1093	905
55	1033	965
60	978	1020
65	928	1070
70	878	1120
75	813	1185
80	765	1233
85	720	1278
90	675	1323
95	630	1368
100	585	1413
105	540	1458
110	495	1503
115	450	1548
120	415	1583
125	385	1613
130	360	1638
135	335	1663
140	310	1688
145	285	1713
150	265	1733
155	250	1748
160	210	1788
165	175	1823
170	131	1867
No Refusal		

Test Date	06/05/2021	DCP No.	202
Site:	Try Again	Hole No.	Side – TP202

No. Blows	DCP02 - Side TP202	NGL
0	1995	0
5	1870	125
10	1745	250
15	1620	375
20	1509	486
25	1398	597
30	1287	708
35	1176	819
40	1067	928
45	958	1037
50	849	1146
55	740	1255
60	631	1364
65	522	1473
70	457	1538
75	392	1603
80	350	1645
85	308	1687
90	266	1729
95	224	1771
100	182	1813
105	140	1855
110	98	1897
No Refusal		

Test Date	06/05/2021	DCP No.	203
Site:	Try Again	Hole No.	Side – TP203

No. Blows	DCP03 - Side TP203	NGL
0	1993	0
5	1876	117
10	1759	234
15	1642	351
20	1522	471
25	1436	557
30	1347	646
35	1258	735
40	1169	824
45	1080	913
50	991	1002
55	902	1091
60	813	1180
65	724	1269
70	635	1358
75	580	1413
80	525	1468
85	470	1523
90	415	1578
95	382	1611
100	349	1644
105	316	1677
110	283	1710
115	250	1743
120	217	1776
125	184	1809
130	151	1842
135	118	1875
No Refusal		

Test Date	06/05/2021	DCP No.	204
Site:	Try Again	Hole No.	Side – TP204

No. Blows	DCP04 - Side TP204	NGL
0	1897	0
5	1790	107
10	1695	202
15	1594	303
20	1493	404
25	1392	505
30	1291	606
35	1187	710
40	1095	802
45	1007	890
50	919	978
55	831	1066
60	743	1154
65	655	1242
70	620	1277
75	585	1312
80	550	1347
85	515	1382
90	480	1417
95	445	1452
100	410	1487
105	375	1522
110	340	1557
115	305	1592
120	270	1627
125	235	1662
130	200	1697
135	163	1734
140	144	1753
145	104	1793
No Refusal		

Test Date	06/05/2021	DCP No.	205
Site:	Try Again	Hole No.	Side – TP205

No. Blows	DCP05 - Side TP205	NGL
0	1985	0
5	1878	107
10	1771	214
15	1664	321
20	1557	428
25	1450	535
30	1343	642
35	1236	749
40	1129	856
45	1022	963
50	915	1070
55	829	1156
60	746	1239
65	663	1322
70	580	1405
75	535	1450
80	490	1495
85	445	1540
90	400	1585
95	335	1650
100	310	1675
105	265	1720
110	220	1765
115	175	1810
120	135	1850
125	95	1890
No Refusal		

Test Date	06/05/2021	DCP No.	206
Site:	Try Again	Hole No.	Side – TP206

No. Blows	DCP06 - Side TP206	NGL
0	1993	0
5	1890	103
10	1791	202
15	1692	301
20	1593	400
25	1494	499
30	1395	598
35	1296	697
40	1197	796
45	1098	895
50	999	994
55	900	1093
60	844	1149
65	791	1202
70	738	1255
75	685	1308
80	632	1361
85	597	1396
90	526	1467
95	473	1520
100	420	1573
105	379	1614
110	338	1655
115	297	1696
120	256	1737
125	174	1819
130	133	1860
135	92	1901

Test Date	06/05/2021	DCP No.	207
Site:	Try Again	Hole No.	Side – TP207

No. Blows	DCP07 - Side TP207	NGL
0	1949	0
5	1850	99
10	1751	198
15	1652	297
20	1553	396
25	1454	495
30	1355	594
35	1256	693
40	1157	792
45	1058	891
50	959	990
55	860	1089
60	788	1161
65	718	1231
70	648	1301
75	573	1376
80	511	1438
85	446	1503
90	385	1564
95	344	1605
100	303	1646
105	262	1687
110	221	1728
115	180	1769
120	139	1810
125	98	1851
No Refusal		

Test Date	06/05/2021	DCP No.	208
Site:	Try Again	Hole No.	Side – TP208

No. Blows	DCP08 - Side TP208	NGL
0	1979	0
5	1878	101
10	1777	202
15	1676	303
20	1575	404
25	1474	505
30	1373	606
35	1272	707
40	1172	807
45	1070	909
50	969	1010
55	893	1086
60	817	1162
65	741	1238
70	665	1314
75	589	1390
80	513	1466
85	439	1540
90	361	1618
95	285	1694
100	209	1770
105	164	1815
110	119	1860
115	74	1905
No Refusal		

Geotechnical Solutions (Pty) Ltd

EARTH CIVIL TESTING

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Web – www.geo-sol.co.za – Tel – 0715608058 – 0799100920 - Email – projects@geo-sol.co.za

Date	10/05/2021	**Client**	Sivest	**Sample No.**	101 A
WN	2113-01	**Project**	Durancol Cemetery	**Depth**	0,8-1,2m
LN	L01-MN01	**Description**	Pale Br to Orange Silty Clay	**Lab Tech**	S. July

Soil Grading Analysis - Mechanical Analysis - SANS 3001 – GR1

Sieve Analysis	Mass Ret	% Ret	% Passing	% Sample Content	
37,500	0	0	100	**Gravel**	1,4
26,500	0	0	100	**Sand**	12,8
19,000	0	0	100	**Fines**	85,8
13,200	0	0	100	**Total**	100,0
4,750	7	1,4	98,6		
2,000	3	0,6	98	**Soil Mortar Grading**	
0,425	18	3,6	94,4	**Coarse Sand**	3,7
0,250	12	2,4	92	**Coarse Fine Sand**	2,4
0,150	15	3	89	**Medium Fine Sand**	3,1
0,075	16	3,2	85,8	**Fine Fine Sand**	3,3
<0,075	429	85,8	0	**Silt & Clay**	87,6
Total	**500**			**Total**	100,0

Natural Moisture Content

Container No. 7	**Container + Sample (Wet)**		660
Dry Sample: 500g	**Container + Sample (Dry)**		638
Container Weight 160g - Mass recorded in grams		**Moisture %**	3,3

Plasticity Atterberg Limits – SANS 3001 – GR1 – GR12

Sample Number	Moisture Content		Plastic Limit		Calculation	
Trough Number	1	2	3	4	**L.L**	40,6
Mass of container	17,6	17,3	17,3	17,2	**P.L**	30,1
Mass Container +Wet	18,7	19,6	19,3	19,5	**P.I**	10,4
Mass Container + Dry	18,3	19,1	18,9	18,9		
Mass of Dry Material	0,75	1,8	1,6	1,7		
Mass of Moisture	0,4	0,5	0,4	0,6		
% Moisture	53,3	27,8	25,0	35,3		
Shrinkage (mm)	8	**Linear Shrinkage = _x(f)**			5,3	**%**
Trough No.	1	**(f= 0.579)**				
Classification	**Unified**		OL - Organic Silt - Oraganic Clay			

For Geotechnical Solutions Pty Ltd:

(Technical Signatory – Nilesh Mahadew)

Geotechnical Solutions (Pty) Ltd

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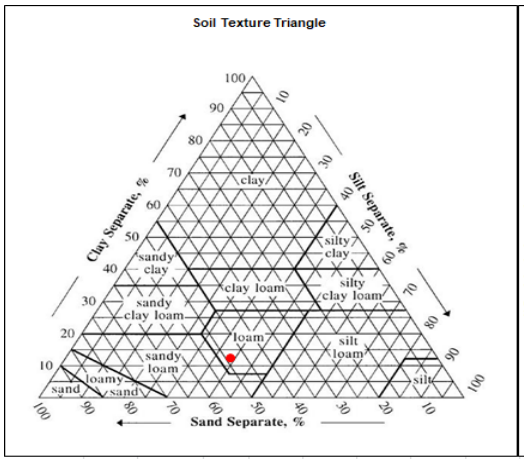
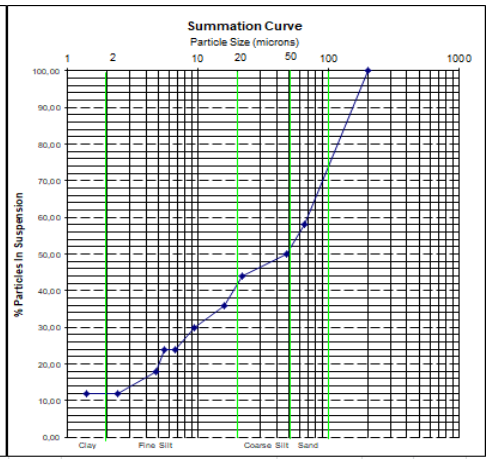
Date	10/05/2021	Client	Sivest	Sample No.	101 A
WN	2113-01	Project	Durancol Cemetery	Depth	0,8-1,2m
LN	L01-MN01	Description	Pale Br to Orange Silty Clay	Lab Tech	S. July

Hydrometer Analysis - (ASTM D422)

Elapsed Time (min)	Time	Hydrometer Reading R	Temp °C
0	8:00:00 AM		
0,5	8:00:30 AM	29	20
1	8:01:00 AM	25	20
5	8:05:00 AM	22	20
10	8:10:00 AM	18	20
30	8:30:00 AM	15	20
60	9:00:00 AM	12	20
90	9:30:00 AM	12	20
120	10:00:00 AM	9	21
480	4:00:00 PM	6	21
1440	8:00:00 AM	6	21

Elapsed Time (min)	R	C (Corrected R)	P	t^0.5	Theta	Effective Diameter	Viscosity	Density
0			100,00	0,000		200		
0,5	29	29	58,00	0,707	46,83403778	66,2333	0,010232925	1,001351452
1	25	25	50,00	1,000	48,14634885	48,1463	0,010232925	1,001351452
5	22	22	44,00	2,236	49,10757342	21,9616	0,010232925	1,001351452
10	18	18	36,00	3,162	50,36067493	15,9254	0,010232925	1,001351452
30	15	15	30,00	5,477	51,2804099	9,3625	0,010232925	1,001351452
60	12	12	24,00	7,746	52,18393717	6,7369	0,010232925	1,001351452
90	12	12	24,00	9,487	52,18393717	5,5007	0,010232925	1,001351452
120	9	9	18,00	10,954	52,44080866	4,7872	0,009992224	1,001139186
480	6	6	12,00	21,909	53,30394545	2,4330	0,009992224	1,001139186
1440	6	6	12,00	37,947	53,30394545	1,4047	0,009992224	1,001139186





For Geotechnical Solutions Pty Ltd:

(Technical Signatory – Nilesh Mahadew)

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Date	10/05/2021	**Client**	Sivest	**Sample No.**	105 B
WN	2113-01	**Project**	Durancol Cemetery	**Depth**	1,0-1,4m
LN	L01-MN01	**Description**	Pale Br to Brown Silty Clay	**Lab Tech**	S. July

Soil Grading Analysis - Mechanical Analysis - SANS 3001 – GR1

Sieve Analysis	Mass Ret	% Ret	% Passing	% Sample Content	
37,500	0	0	100	**Gravel**	0,0
26,500	0	0	100	**Sand**	16,0
19,000	0	0	100	**Fines**	84,0
13,200	0	0	100	**Total**	100,0
4,750	0	0	100		
2,000	7	1,4	98,6	**Soil Mortar Grading**	
0,425	22	4,4	94,2	**Coarse Sand**	4,5
0,250	15	3	91,2	**Coarse Fine Sand**	3,0
0,150	18	3,6	87,6	**Medium Fine Sand**	3,7
0,075	18	3,6	84	**Fine Fine Sand**	3,7
<0,075	420	84	0	**Silt & Clay**	85,2
Total	**500**			**Total**	100,0

Natural Moisture Content

Container No. 7	**Container + Sample (Wet)**		660
Dry Sample: 500g	**Container + Sample (Dry)**		637
Container Weight 160g - Mass recorded in grams		**Moisture %**	3,5

Plasticity Atterberg Limits – SANS 3001 – GR1 – GR12

Sample Number	Moisture Content		Plastic Limit		Calculation	
Trough Number	5	6	7	8	**L.L**	42,2
Mass of container	17,7	17,7	18,0	17,6	**P.L**	30,1
Mass Container +Wet	19,1	19,0	19,2	19,4	**P.I**	12,1
Mass Container + Dry	18,7	18,6	18,9	19,0		
Mass of Dry Material	1	0,9	0,95	1,4		
Mass of Moisture	0,4	0,4	0,3	0,4		
% Moisture	40	44,4	31,6	28,6		
Shrinkage (mm)	9	**Linear Shrinkage = _x(f)**			6,0	**%**
Trough No.	2	**(f= 0.579)**				
Classification	**Unified**		OL - Organic Silt - Oraganic Clay			

For Geotechnical Solutions Pty Ltd:

(Technical Signatory – Nilesh Mahadew)

Geotechnical Solutions (Pty) Ltd

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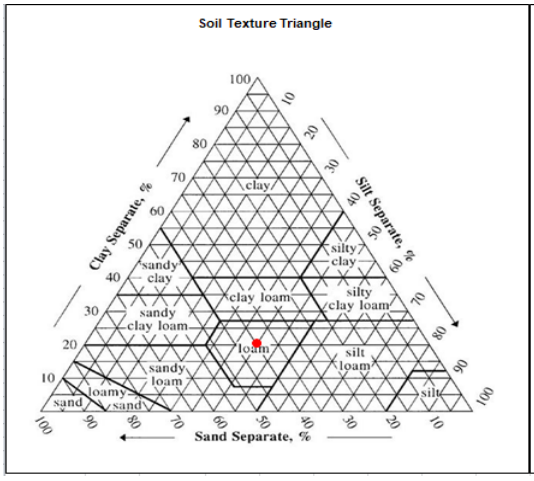
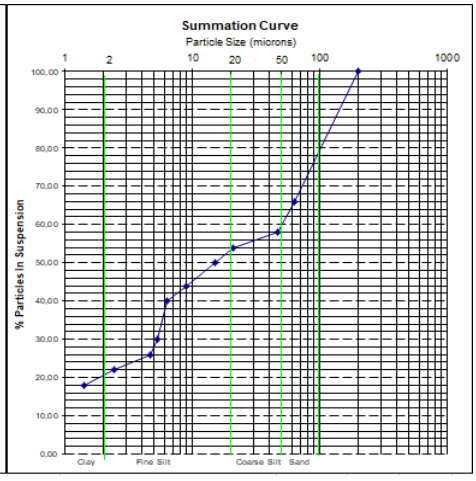
Date	10/05/2021	Client	Sivest	Sample No.	105 B
WN	2113-01	Project	Durancol Cemetery	Depth	1,0-1,4m
LN	L01-MN01	Description	Pale Br to Brown Silty Clay	Lab Tech	S. July

Hydrometer Analysis - (ASTM D422)

Elapsed Time (min)	Time	Hydrometer Reading R	Temp °C
0	8:00:00 AM		
0,5	8:00:30 AM	33	21
1	8:01:00 AM	29	21
5	8:05:00 AM	27	21
10	8:10:00 AM	25	21
30	8:30:00 AM	22	21
60	9:00:00 AM	20	21
90	9:30:00 AM	15	21
120	10:00:00 AM	13	21
480	4:00:00 PM	11	19
1440	8:00:00 AM	9	19

Elapsed Time (min)	R	C (Corrected R)	P	t^0.5	Theta	Effective Diameter	Viscosity	Density
0			100,00	0,000		200		
0,5	33	33	66,00	0,707	44,94286281	63,5588	0,009992224	1,001139186
1	29	29	58,00	1,000	46,27696151	46,2770	0,009992224	1,001139186
5	27	27	54,00	2,236	46,92979109	20,9876	0,009992224	1,001139186
10	25	25	50,00	3,162	47,57366305	15,0441	0,009992224	1,001139186
30	22	22	44,00	5,477	48,52345415	8,8591	0,009992224	1,001139186
60	20	20	40,00	7,746	49,14645183	6,3448	0,009992224	1,001139186
90	15	15	30,00	9,487	50,67044542	5,3411	0,009992224	1,001139186
120	13	13	26,00	10,954	51,26735964	4,6800	0,009992224	1,001139186
480	11	11	22,00	21,909	53,18729849	2,4277	0,010508663	1,001553186
1440	9	9	18,00	37,947	53,78566531	1,4174	0,010508663	1,001553186





For Geotechnical Solutions Pty Ltd:

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Date	10/05/2021	**Client**	Sivest	**Sample No.**	205 C
WN	2114-01	**Project**	Try Again Cemetery	**Depth**	1,1-1,5m
LN	L01-MN01	**Description**	Dark to Pale Or Silty Clay	**Lab Tech**	S. July

Soil Grading Analysis - Mechanical Analysis - SANS 3001 – GR1

	Sieve Analysis	**Mass Ret**	**% Ret**	**% Passing**	**% Sample Content**	
	37,500	0	0	100	**Gravel**	0,6
	26,500	0	0	100	**Sand**	39,4
	19,000	0	0	100	**Fines**	60,0
	13,200	0	0	100	**Total**	100,0
	4,750	3	0,6	99,4		
	2,000	9	1,8	97,6	**Soil Mortar Grading**	
	0,425	70	14	83,6	**Coarse Sand**	14,3
	0,250	51	10,2	73,4	**Coarse Fine Sand**	10,5
	0,150	39	7,8	65,6	**Medium Fine Sand**	8,0
	0,075	28	5,6	60	**Fine Fine Sand**	5,7
	<0,075	300	60	0	**Silt & Clay**	61,5
	Total	**500**			**Total**	100,0

Natural Moisture Content

Container No. 7	**Container + Sample (Wet)**		660
Dry Sample: 500g	**Container + Sample (Dry)**		642
Container Weight 160g - Mass recorded in grams		**Moisture %**	2,7

Plasticity Atterberg Limits – SANS 3001 – GR1 – GR12

Sample Number	**Moisture Content**		**Plastic Limit**		**Calculation**	
Trough Number	9	10	11	12	**L.L**	30,6
Mass of container	17,5	17,2	17,1	17,1	**P.L**	21,1
Mass Container +Wet	18,9	18,8	19,3	18,9	**P.I**	9,5
Mass Container + Dry	18,5	18,5	18,9	18,6		
Mass of Dry Material	1,05	1,3	1,8	1,5		
Mass of Moisture	0,4	0,3	0,4	0,3		
% Moisture	38,1	23,1	22,2	20		
Shrinkage (mm)	7	**Linear Shrinkage = _x(f)**			4,7	**%**
Trough No.	3	**(f= 0.579)**				
Classification	**Unified**		OL - Organic Silt - Oraganic Clay			

For Geotechnical Solutions Pty Ltd:

(Technical Signatory – Nilesh Mahadew)

Results in this report relate only to the samples as taken, and the condition received by the laboratory.

Geotechnical Solutions (Pty) Ltd

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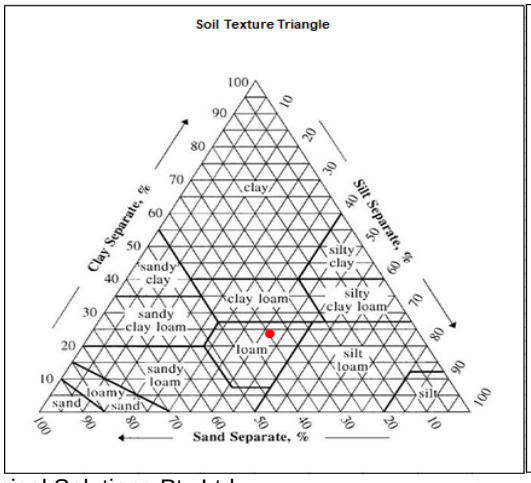
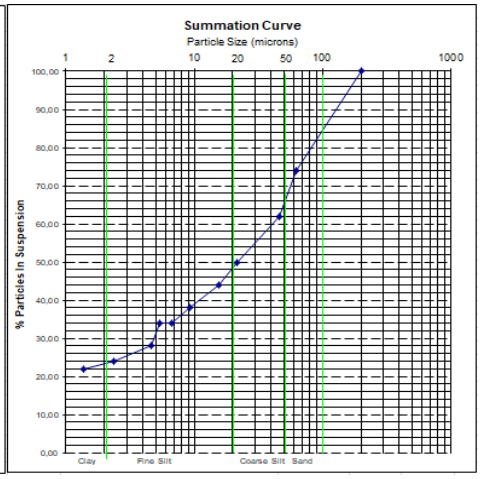
Date	10/05/2021	Client	Sivest	Sample No.	205 C
WN	2114-01	Project	Try Again Cemetery	Depth	1,1-1,5m
LN	L01-MN01	Description	Dark to Pale Or Silty Clay	Lab Tech	S. July

Hydrometer Analysis - (ASTM D422)

Elapsed Time (min)	Time	Hydrometer Reading R	Temp °C
0	8:00:00 AM		
0,5	8:00:30 AM	37	20
1	8:01:00 AM	31	20
5	8:05:00 AM	25	20
10	8:10:00 AM	22	20
30	8:30:00 AM	19	19
60	9:00:00 AM	17	19
90	9:30:00 AM	17	19
120	10:00:00 AM	14	21
480	4:00:00 PM	12	20
1440	8:00:00 AM	11	20

Elapsed Time (min)	R	C (Corrected R)	P	t^0.5	Theta	Effective Diameter	Viscosity	Density
0			100,00	0,000		200		
0,5	37	37	74,00	0,707	44,09239695	62,3561	0,010232925	1,001351452
1	31	31	62,00	1,000	46,16389486	46,1639	0,010232925	1,001351452
5	25	25	50,00	2,236	48,14634885	21,5317	0,010232925	1,001351452
10	22	22	44,00	3,162	49,10757342	15,5292	0,010232925	1,001351452
30	19	19	38,00	5,477	50,72329283	9,2608	0,010508663	1,001553186
60	17	17	34,00	7,746	51,35037981	6,6293	0,010508663	1,001553186
90	17	17	34,00	9,487	51,35037981	5,4128	0,010508663	1,001553186
120	14	14	28,00	10,954	50,96977635	4,6529	0,009992224	1,001139186
480	12	12	24,00	21,909	52,18393717	2,3819	0,010232925	1,001351452
1440	11	11	22,00	37,947	52,48165634	1,3830	0,010232925	1,001351452





For Geotechnical Solutions Pty Ltd:

(Technical Signatory – Nilesh Mahadew)

Results in this report relate only to the samples as taken, and the condition received by the laboratory.