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CONSULTING CIVIL & STRUCTURAL ENGINEER

REPORT ON A GEOLOGICAL SITE INVESTIGATION FOR A PROPOSED DEVELOPMENT ON PORTION 2 OF HOLDING 49, WILLOW GLEN AGRICULTURAL HOLDINGS, TSHWANE METROPOLITAN MUNICIPALITY

DATE OF INVESTIGATION: 26th MAY 2021

Report No 2021-01-G1 16th June 2021

Consultant

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CONTENTS

GEOTECHNICAL INVESTIGATION: PORTION 2 OF HOLDING 49, WILLOW GLEN AH

1 EXECUTIVE SUMMARY

Geology: The site is blanketed by dark brown clay, varying in thickness between approximately 0.45 and 1.50 m. The clay is underlain by brown and black mottled, very soft rock diabase.

Topography: The site has a uniform gradient of approximately 2.5 % in an easterly direction. The size of the property under discussion is 1.00 hectare.

Groundwater conditions: No water seepage was encountered in any test pit during the investigation.

Drainage: The natural overland drainage on the site towards the east is satisfactory and no areas of standing water or marshes were encountered during the investigation.

Excavation conditions: The ground conditions for trench- and mass excavations on the site is classified as soft to depths of approximately 1.5 m on average. Very soft rock [weathered diabase] exists at levels between 1.0 m to 2.5 m on average.

Founding Conditions: Good founding conditions exist only in the weathered diabase. Problematic founding conditions may exist in the clayey colluvium.

Slope Stabilities: Slope instability is unlikely to be encountered in excavations in both clay and the weathered rock but general precautions are nevertheless recommended, especially in wet conditions.

2 TERMS OF REFERENCE

The writer was formally appointed by the property owner during May 2021 to conduct a Phase I geotechnical site investigation on the property. The objective of the investigation was to determine the geotechnical and engineering properties of soil material present on the site and to report on the characteristics of the materials.

3 AIMS OF THE INVESTIGATION

The aim of the investigation and report is....:

....to allow the Applicant to assess the development potential of the property as well as to provide information on prevailing site conditions which may affect the viability and cost of the proposed development;
....to satisfy the Local Authority and NHBRC that favourable soil conditions for the development of the property exist on the site;
....to provide site classifications and recommendations for further development of the site.

The report is not intended to provide a detailed or academic evaluation of geology on the site. The report cannot be used to obtain specific, particular and final specifications for construction work on the property. Detailed design of building foundations and specifications for earthworks, building frames, road construction, installation of services, etc., including the certification of such work, need to be carried out by a professional engineer.

Further investigations of the site, specifically to determine the depth below ground level of residual material, will be beneficial to assist in determining the most feasible and economic foundation system. The use of dynamic cone penetration (DCP) testing is recommended for this purpose.

4 METHODS OF INVESTIGATION

Nine test pits were excavated on the site by the developer for the purpose of this investigation. The test pits were visually inspected, profiled and samples were retrieved for testing, as shown on the soil profiles in the Annexure to this report.

The material encountered in the test pits was profiled in accordance with the guidelines of J E Jennings et al.

Indicator tests including hydrometer analyses, CBR and MOD AASHTO parameter tests were performed on samples from the test pits by SIGMALAB Civil Engineering Testing Laboratories to determine the inherent characteristics of the soil and the results of these tests are included in the Annexure to this report.

The characteristics of the material encountered on site were such that the determination of a collapse potential test was deemed unnecessary.

5 DESCRIPTION OF THE SITE

The site is indicated on the Site and Soil Map in the Annexure to this report. The site under discussion is situated directly north-west of the intersection of Furrow Road and Ouklipmuur Avenue on Portion 2 of Holding 49, Willow Glen Agricultural Holdings, Pretoria. The site is surrounded by existing agricultural holdings and proclaimed townships on all sides and is situated approximately 0,75 km south of the existing N4 (Pretoria-Witbank) freeway. The site contains a few abandoned buildings and is further covered with grass, gardens and trees. The site has a natural slope of approximately 2.5 % towards the east. All essential municipal services exist within a reasonable distance from, or along the boundaries of the site.

6 REGIONAL GEOLOGY AND SOIL PROFILES

The site is underlain by materials of the Magaliesberg Formation, Pretoria Group, Transvaal Supergroup. A diabase intrusion traverses the site, according to information obtained from the 1:50 000 Geological Map. Weathered diabase was encountered in all the test pits. No hard rock outcrops exist on the site and no water seepage occurred in any of the test pits during the investigation.

No materials normally associated with the formation of sinkholes exist on the site.

Due to the relative uniformity of materials encountered, the site cannot be apportioned into prominent material zones. A single zone is therefore used, named "A", as shown on the Site and Soil Map in the Annexure to this report.

A brief overview of the soil characteristics in a typical soil horizon on this site follows hereafter:

0 to approx. 1.0 m on average:	Firm, dark brown to black, sandy clay, often with sparse gravel nodules. Colluvium.
Underlying the colluvium	Weathered diabase.

Further information about the engineering characteristics of the soils is provided on the Site and Soil Map, which together with detailed profiles are included in the Annexure to this report. Further discussions on the suitability of the materials in the different zones are contained later in this report.

7 HYDROLOGY

The site is situated in an area with an average summer rainfall of approximately 650 mm. Natural drainage of the site occurs towards the east. No areas which may be affected by a 1 in 50 or 1 in 100-year flood line, exist on the site.

8 SITE CLASSIFICATION AND EVALUATION OF FOUNDING CONDITIONS

8.1 Site Classification to NHBRC requirements:

For the purposes of this report and in view of the intended use of the site, only materials in the depth horizon up to 1.0 m are considered. A site classification **H2**, based on the NHBRC method, is recommended for all materials in this horizon over the whole extent of the site. This classification is relevant to an expected total heave between 15 mm and 30 mm.

Although the clay material has a high clay content, the overall PI is fairly high, resulting in an expected "low" potential expansiveness. However, it would be prudent to assume that the H2 classification is essential for obtaining good quality masonry building superstructures. This site classification is in accordance with guidelines of the NHBRC, Table 1, Part 1, Section 2, of their "HOME BUILDING MANUAL" dated February 1999.

The above classification is also in accordance with the guidelines of the Code of Practice, "Foundations and Superstructures for Single Storey Residential Buildings of Masonry Construction" of SAICE (1995).

8.2 Evaluation of Founding Conditions

For the purposes of this report, it is assumed that buildings brickwork and concrete with a height restriction of 10 m will be erected on the site, in accordance with the prevailing zoning parameters applicable to residential developments in Equestria.

Brickwork and concrete structures can be founded on concrete strip or pad footings at depths between 0,40 and 1,00 metres, only if strict precautionary measures, such as reinforcement, articulated, reinforced brickwork and good stormwater management are implemented. A safe bearing pressure on this material is deemed to be 150 kPa. Depending on the location of a proposed structure on this site, removal of unsuitable material and replacement thereof to a depth where the residual weathered diabase exists, thereafter filled with competent, compacted gravel, may be feasible.

Due to the potential activity of the clay material in the upper horizons, the use of concrete or soil raft foundations is however recommended, should the foregoing methods be deemed impractical and/or uneconomical.

Note: The recommendations contained in this report must be treated as guidelines. The type of foundation system needs to be specified by an appointed competent person at the time when the layout, size and location of a proposed building are available.

9 RECOMMENDATIONS

9.1 UNDERGROUND PIPE SERVICES

No special precautionary measures are needed for the construction of pipe services. The use of concrete pipes for stormwater and uPVC pipes for sewerage and water supply are recommended and selected material obtained from the weathered diabase in trench excavations may be suitable for bedding and selected fill in pipe trenches.

9.2 ROADS

The characteristics the clay material in the upper horizons on the site is such that this material is deemed sufficient to be used as road bed material only, depending on the required road classification.

It is recommended that all selected layers of roads be obtained from commercial sources, unless the weathered diabase material obtained from deep excavations becomes available.

9.3 FOUNDATIONS OF BUILDINGS

From the recommendations contained earlier in this report, the Local Authority is advised to ensure the appointment of a competent person, for all buildings to be erected on this site. The purpose of the certification is to ensure that measures to counteract the adverse effect of problem soils and such certification should be a prerequisite for the approval of building plans.

The following alternative methods of construction for building foundations may be considered by the appointed structural engineer for building foundations:

a) Reinforced concrete raft foundations installed on an imported gravel soil platform.

b) Removal of all in situ material to approximately 250 mm deeper than the upper level of the weathered diabase and over an area approximately 1.5 metres larger than the footprint of the proposed building. The construction of a soil raft with imported gravel material, compacted in layers of 150 mm to a density of 95% Modified AASHTO. There after the construction of conventional strip footings in the soil raft, and implementation of precautionary measures such as light reinforcement, articulated joints in brickwork and good stormwater management.

c) Removal of unsuitable material from deep foundation trenches and filling of trenches with suitable imported gravel, compacted in layers of 150 mm to a density of 95% Modified AASHTO. There after follows the construction of conventional reinforced strip footings and implementation of precautionary measures such as brickwork reinforcement, articulated joints in brickwork and good stormwater management. Soilcrete fill may also be used in place of the imported gravel.

Note: The clayey colluvium is deemed totally unsuitable for use as filling under building floors.

9.4 STORMWATER DRAINAGE

The site must be properly drained to prevent accumulation of large quantities of stormwater in one place. The provision of impervious paved aprons around building perimeters is recommended.

10 RECOMMENDATIONS TO LOCAL AUTHORITY

The appointment of a professional engineer or other approved competent person should be required for the purpose of structural and services design and must be made a prerequisite for building plan approval. Such appointments must also include the responsibility of internal stormwater management on the site.

The following condition should be inserted in the town planning scheme and be made applicable to the individual erven:

'The erven lie in an area where soil conditions could adversely affect buildings and structures, with resulting damage. Building plans submitted to the Local Authority must indicate measures to be taken to limit possible damage to buildings as a result of detrimental founding conditions."

11 CONCLUSION

The purpose of this report is to provide a general overview of geological conditions on the site, specifically to ensure that township establishment in accordance with the usual application process may proceed. It is certified by the writer that the site of the investigation, in terms of the prevailing soil conditions, is deemed totally suitable for residential or light commercial township development.

R J Koekemoer Pr Eng
for Rudy Koekemoer CC
Consulting Civil & Structural Engineer
16th June 2021

12 REFERENCES

1. WEINERT, HH. The natural road construction materials of Southern Africa, Pretoria 1980.
2. TRH 9. Construction of road embankments, 1982.
3. BRINK, ABA. Engineering Geology of Southern Africa, Volume 4, 1985.
4. WATERMEYER, RB. TROMP BE. A systematic approach to the design and construction of single-storey residential masonry structures on problem soils, The Civil Engineer in South Africa, March 1992.
5. A Revised Guide to Soil Profiling for Civil Engineering Purposes in Southern Africa, by J. E. Jennings et al, 1973.
6. Site Investigation Code of Practice: The Geotechnical Division of SAICE, 2010.
7. Code of Practice: The Design of Foundations for Single Storey Residential Buildings of Masonry construction: The Joint Structural Division of SAICE and IStruct, 1995.
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9. SANS 634: 2012: Geotechnical Investigations for Township Development.
10. NHBRC Home Building Manual: Part 1 & 2, 1999.
11. The Prediction of Heave from the Plasticity Index and Percentage Clay Fraction of Soils: A Paper by D. H. Van Der Merwe – The Civil Engineer in SA – June 1964.

13 ANNEXURES

Documents and drawings attached to this report:

LOCALITY PLAN

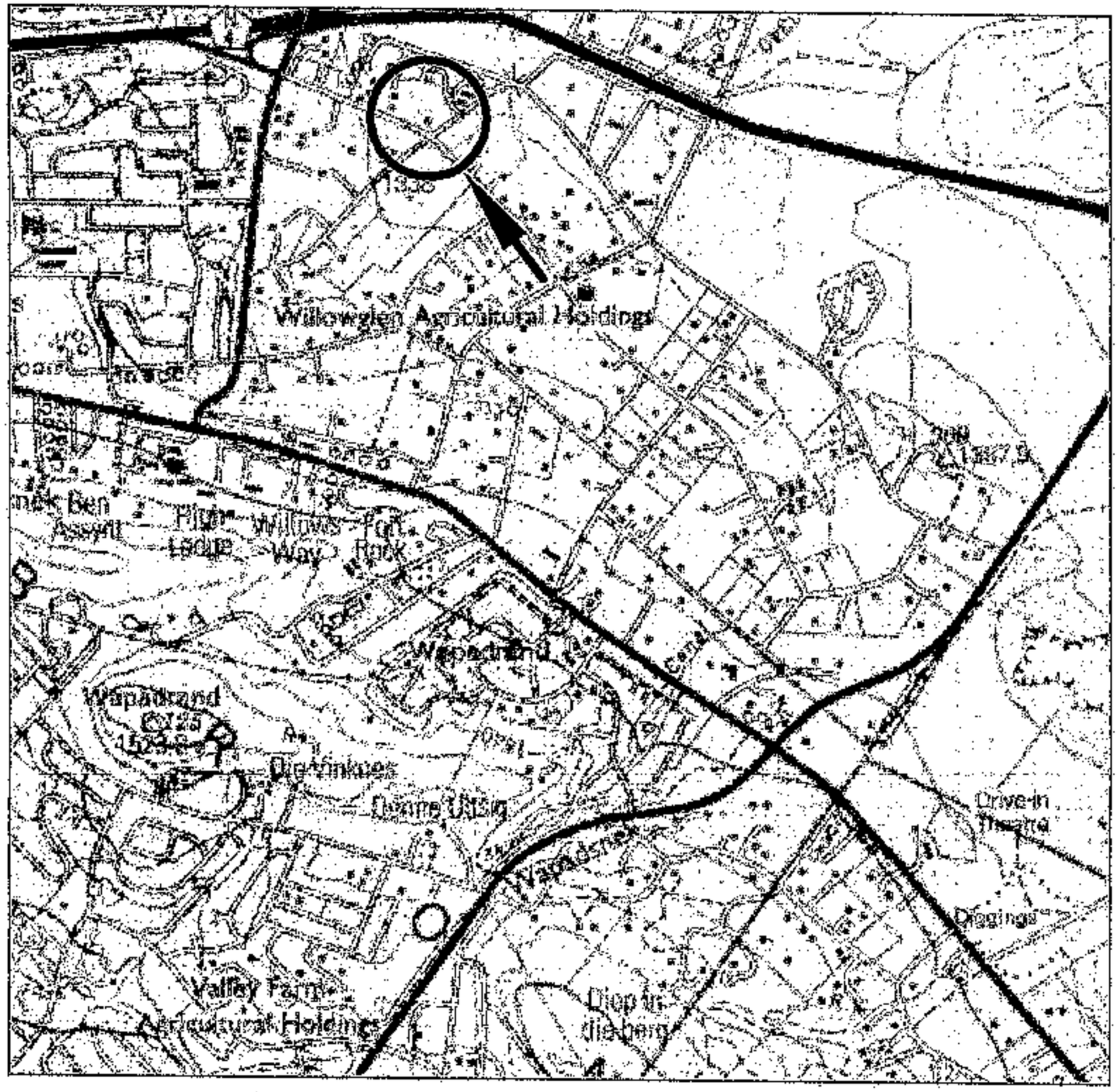
LABORATORY TEST RESULTS

SOIL PROFILES

SITE AND SOIL MAP

REGIONAL GEOLOGY MAP

LOCALITY PLAN



LOCALITY PLAN: PORTION 2 OF HOLDING 49, WILLOW GLEN AH

PROJECT	DEVELOPER	CONSULTANT	TITLE OF THIS DRAWING
GEOTECHNICAL INVESTIGATION AND REPORT for the DEVELOPMENT OF PORTION 2 OF HOLDING 49 WILLOW GLEN AGRICULTURAL HOLDINGS, PRETORIA	BASTION DEVELOPMENT GROUP 70 MOTOR CRESCENT SILVERTON	RUDY KOEKEMOER CC Consulting Civil Engineer PO BOX 66342 HIGHVELD 082 565 6538 0169 012-665 4299	LOCALITY PLAN DATE: June 2021 CONSULTANT'S DRAWING No.: 2021-01-01

LABORATORY TEST RESULTS

SUMMARY OF MATERIAL TEST RESULTS: PORTION 1 OF HOLDING 49, WILLOW GLEN AH

Three (3) foundation indicator tests and one (1) road indicator test were carried out by SIGMALAB, an accredited civil engineering testing laboratory, to define the material properties. The number of tests is deemed sufficient for the purposes of this report, due to similar characteristics of sub-soil materials encountered in the various test pits. The number of laboratory tests carried out also complies with the requirement in SANS 634:2012. The results are summarized in the following Table:

TABLE - TEST RESULTS for FOUNDATION INDICATOR TESTS

Test pit no.	Depth of sample (m)	Liquid limit %	Linear Shrinkage %	Plasticity Index %	Overall Plasticity Index %	Grading Modulus	Potential expansiveness
2	0.70-0.90	77	16	28	27	0.2	Low
5	2.0	41	7.5	13	6	1.3	Low
7	0.9-1.2	36	5.0	12	3	1.8	Low

TABLE - TEST RESULTS for ROAD INDICATOR TEST

Test pit no.	Depth of sample (m)	Max. dry density (kg/m³)	Optimum moisture content (%)	CBR	CLASSIFICATIONS
7	0.9-1.2	2002	8.7	38 @100% 17 @ 95% 8 @ 90%	A-2-6(0) [HRB (AASHTO)] G8 [COLTO]

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Civil Engineering Testing Laboratories

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Website: www.sigmalab.co.za

ROAD INDICATOR TEST REPORT

Client	: Rudy Koekemoer cc	**Client Reference**	: Portion 2 of 49 Willow Glen
Address	: 21 Boca Walk	**Order Number**	: N/A
	: Highveld Extension 7		
	: Centurion, 0157		
Attention	: Rudy Koekemoer	**Date Received**	: 27/05/2021
E-mail	: rkcc@vodamail.co.za	**Date Tested**	: 27/05/2021 - 15/06/2021
Project	: Portion 2 of 49 Willow Glen	**Date Reported**	: 16/06/2021
Job Number	: S0619	**Report Status**	: Final

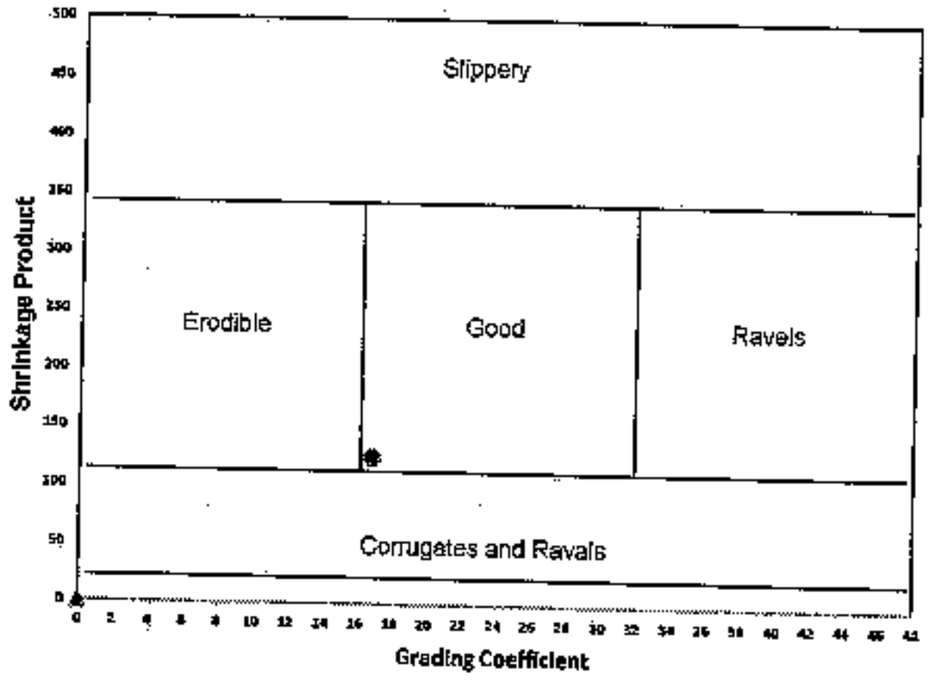
SAMPLE INFORMATION AND PROPERTIES		
Sample Number	661 *	▲
Sample Position	TP 7	
Client Marking	TP 7	
Sample Depth (mm)	0,9 - 1,2m	
Sample Container	Plastic Bags	
Condition of Sample	Good	
Sample Size / Weight (g)	±80kg	
Description of Sample	-	
Colour	-	
Type	-	
Sampled By	Client	

SANS 3001-GR1		
Sieve Apertue Size	**Percentage Passing Nearest 1%**	
100	100	
75	100	
63	100	
50	100	
37,5	100	
28	100	
20	100	
14	100	
5	99	
2	83	
0,425	25	
0,250	16	
0,150	11	
0,075	8	

SANS 3001-PR5		
Soil-mortar (%)	83,0	
Coarse sand soil-mortar (%)	69,9	
Fine sand soil-mortar (%)	20,5	
Coarse fine sand soil-mortar (%)	10,8	
Medium fine sand soil-mortar (%)	6,0	
Fine fine sand soil-mortar (%)	3,6	
Silt and clay soil-mortar (%)	9,6	
Coarse sand ratio	0,7	
Grading Modules	1,8	

SANS 3001-GR10		
Liquid Limit (%)	36	
Plastic Limit (%)	24	
Plasticity Index (%)	12	
Linear Shrinkage (%)	5,0	

Performance as Gravel Wearing Course

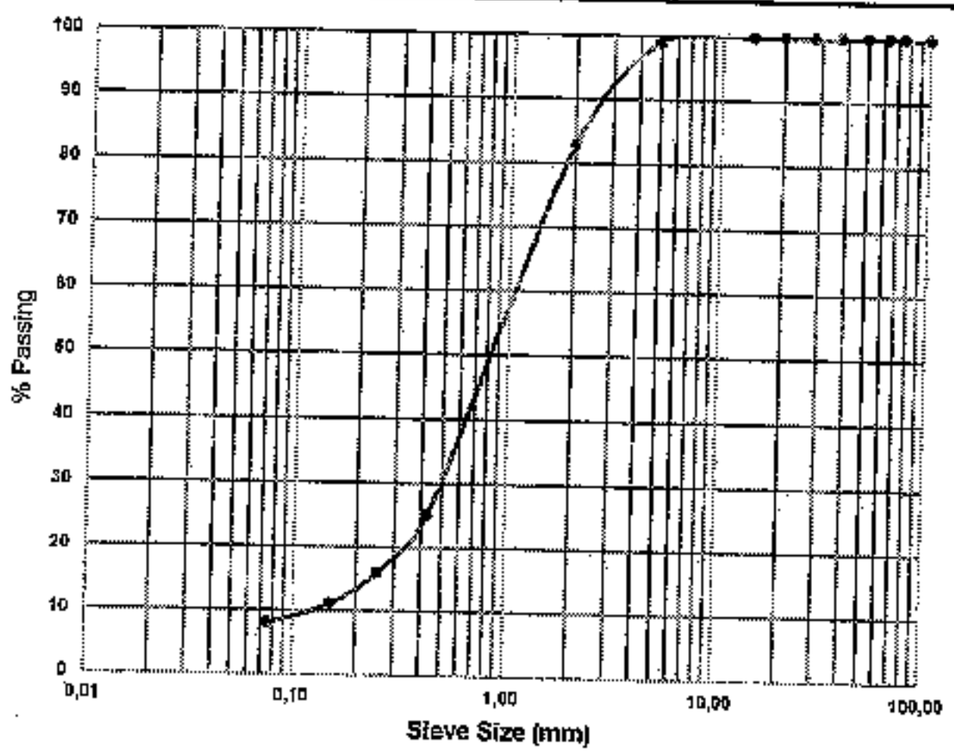


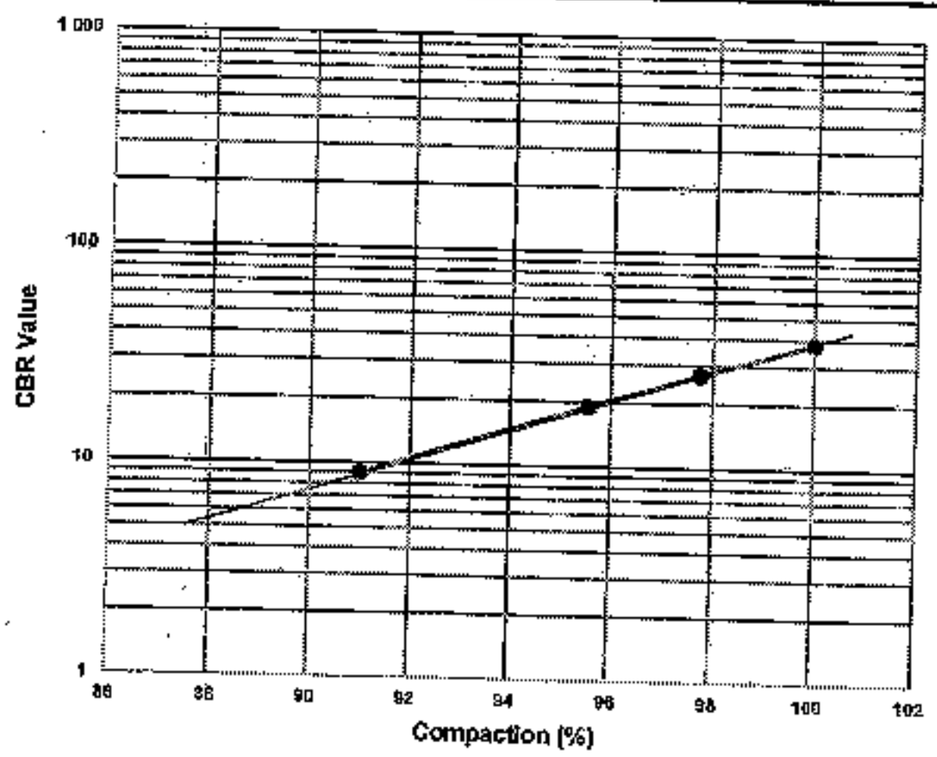
SANS 3001-GR30		
Maximum Dry Density (kg/m³)	2002	
Optimum Moisture Content (%)	8,7	

SANS 3001-GR40						
Compaction Moisture (%)	8,5					
Dry Density (kg/m³)	2021	1931	1839			
Compaction (%)	100,0	95,5	91,0			
CBR @2,5mm	38	19	9			
Swell %	0,3	0,6	0,9			
Final Moisture Content (%)	11,3	13,0	16,9			

CBR DATA	
100 (%)	38
98 (%)	29
97 (%)	24
95 (%)	17
93 (%)	13
90 (%)	8
Midpoint (%)	27

CLASSIFICATIONS	
HRB (AASHTO)	A-2-6(0)
COLTO	G8
TRH 14	-





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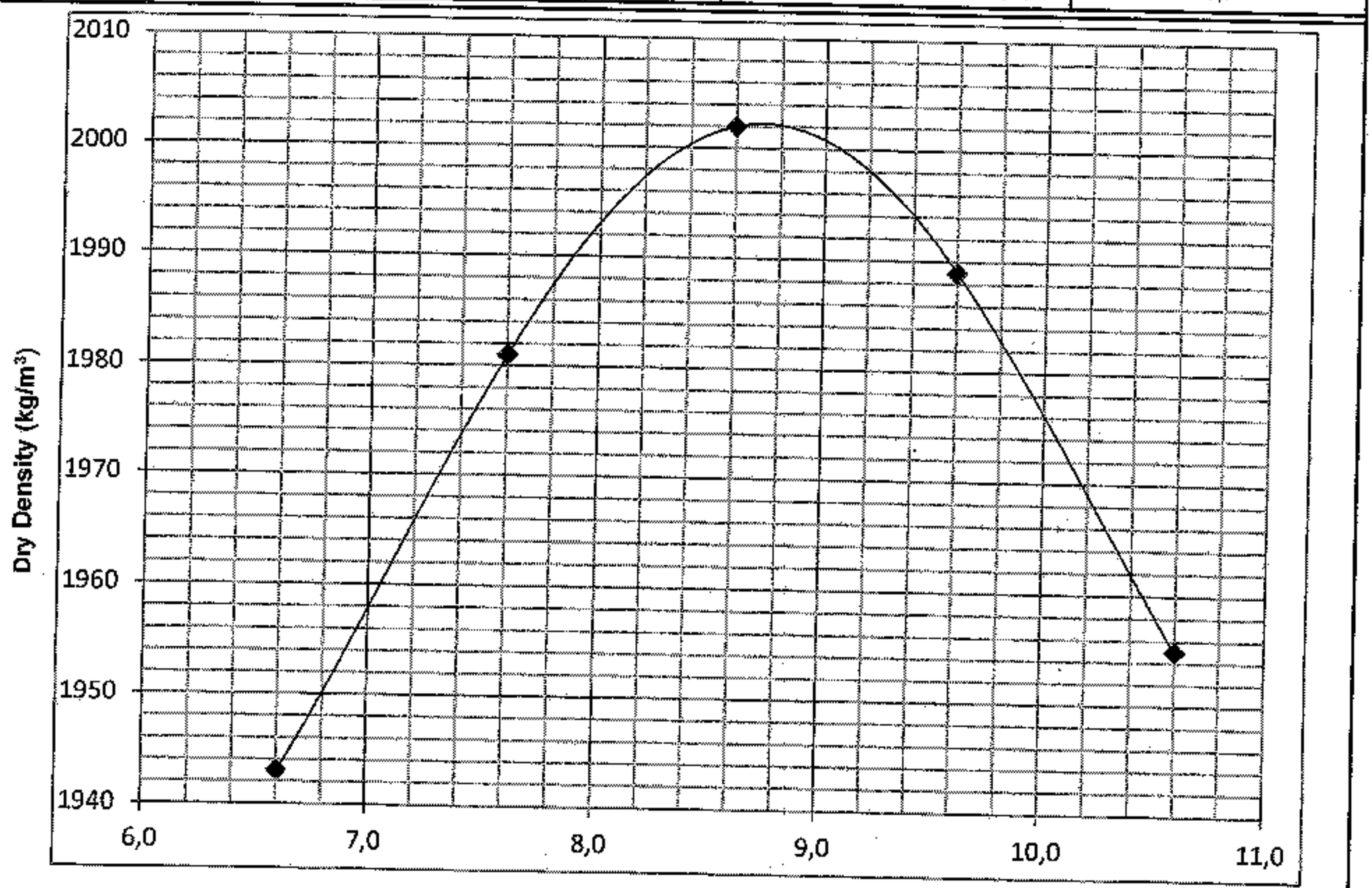
Website: www.sigmalab.co.za

TEST REPORT

Client	:	Rudy Koekemoer cc	Client Reference	:	Portion 2 of 49 Willow Glen
	:	21 Boca Walk	Order Number	:	N/A
	:	Highveld Extension 7			
	:	Centurion			
	:	0157			
Attention	:	Rudy Koekemoer	Date Received	:	27/05/2021
E-mail	:	rkcc@vodamail.co.za	Date Tested	:	27/05/2021 - 15/06/2021
Project	:	Portion 2 of 49 Willow Glen	Date Reported	:	16/06/2021
Job Number	:	S0619	Report Status	:	Final

SANS 3001-GR30: Maximum Dry Density and Optimum Moisture Content

Sample Number:	661			Field Reference:	TP 7	
Depth (mm):	0,9 - 1,2m					
Description:	TP 7					
Compaction Effort:	Modified AASHTO					
Dry Density (kg/m³):	1943	1981	2002	1989	1955	
Moisture Content (%)	6,6	7,6	8,6	9,6	10,6	
Maximum Dry Density (kg/m³):	2002		Optimum Moisture Content (%):		8,7	



Remarks: The samples were subjected to analysis according to test method SANS 3001 GR30. The results reported relate only to the samples tested.

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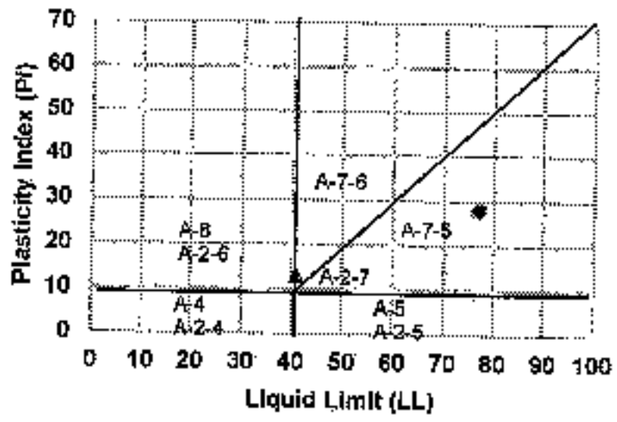
FOUNDATION INDICATOR TEST REPORT

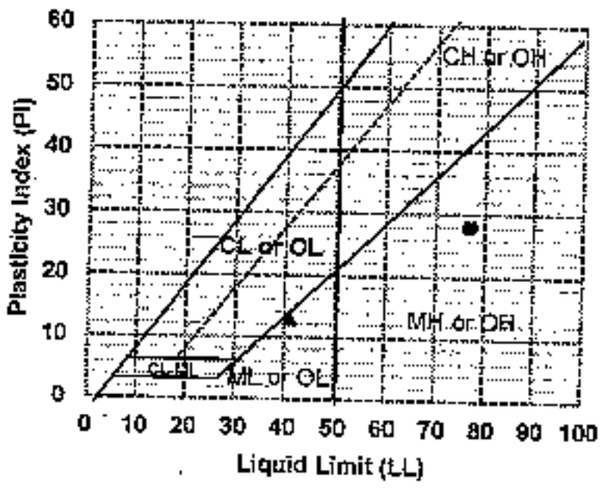
Client	: Rudy Koekemoer cc	**Client Reference**	:	Portion 2 of 49 Willow Glen	
Address	: 21 Boca Walk	**Order Number**	:	N/A	
	: Highveld Extension 7				
	: Centurion, 0169				
Attention	: Rudy Koekemoer	**Date Received**	:	27/05/2021	
E-mail	: rkcc@vodamail.co.za	**Date Tested**	:	27/05/2021	- 15/06/2021
Project	: Portion 2 of 49 Willow Glen	**Date Reported**	:	16/06/2021	
Job Number	: S0619	**Report Status**	:	Final	

SAMPLE INFORMATION AND PROPERTIES		
Sample Number	659 ●	660 ▲
Sample Position	TP 2	TP 5
Client Marking	TP 2	TP 5
Sample Depth (m)	0,7 - 0,9m	2,0m
Sample Container	Plastic Bag	Plastic Bag
Condition of Sample	Good	Good
Sample Size / Weight (g)	±10kg	±10kg
Description of Sample	-	-
Colour	-	-
Type	-	-
Sampled By	Client	Client
SANS 3001-GR1 and SANS 3001-GR3 (Hydrometer)		
Sieve Apertue Size (mm)	**Percentage Passing Nearest 1%**	
100	100	100
75	100	100
63	100	100
50	100	100
37,5	100	100
28	100	100
20	100	100
14	100	100
5	99	100
2	98	97
1	97	73
0,425	96	48
0,250	93	34
0,150	90	26
0,075	87	21
0,039 ● / 0,042 ▲	80	17
0,019 / 0,020	76	14
0,012 / 0,012	74	10
0,006 / 0,006	70	6
0,002 / 0,002	66	2
SANS 3001-PR5		
Soil-mortar (%)	98,0	97,0
Coarse sand soil-mortar (%)	2,0	50,5
Fine sand soil-mortar (%)	9,2	27,8
Coarse fine sand soil-mortar (%)	3,1	14,4
Medium fine sand soil-mortar (%)	3,1	8,2
Fine fine sand soil-mortar (%)	3,1	5,2
Silt and clay soil-mortar (%)	68,8	21,6
Coarse sand ratio	0,0	0,5
Grading Modulus = GM	0,2	1,3
SANS 3001-GR10		
Liquid Limit (%)	77	41
Plastic Limit (%)	49	28
Plasticity Index (%)	28	13
Linear Shrinkage (%)	16,0	7,5
Overall Plasticity Index (%)	27	6
SANS 3001-GR20 and SANS 5844		
Moisture Content (%)	N/T	N/T
Relative Density (kg/m³)	N/T	N/T
SOIL CLASSIFICATIONS		
AASHTO (ASTM D3282)	A-7-5(20)	A-2-7(0)
USCS (ASTM D2487)	MH	SM

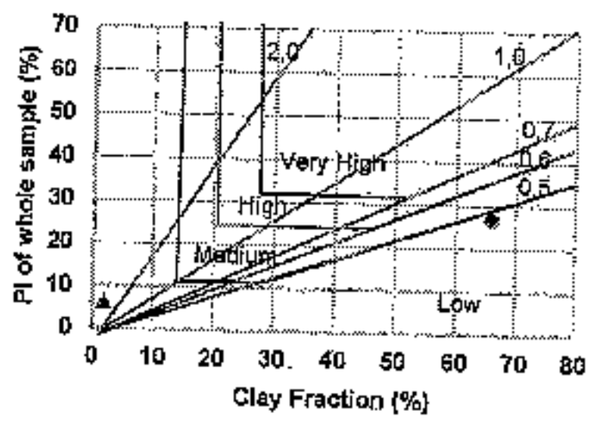
Plasticity Chart AASHTO



Casagrande Chart



Plasticity Chart: Van der Merwe



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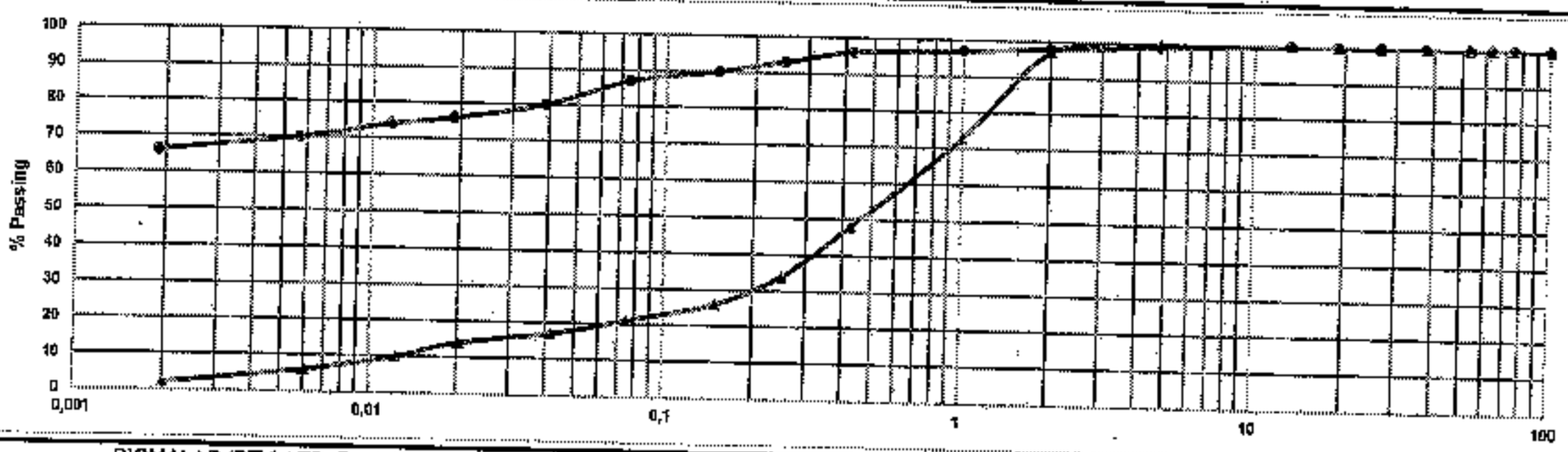

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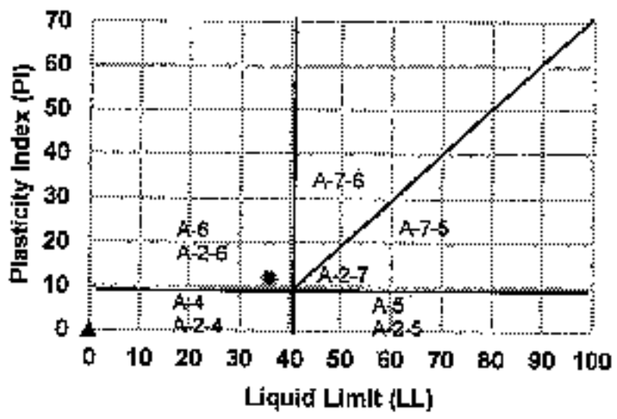
FOUNDATION INDICATOR TEST REPORT

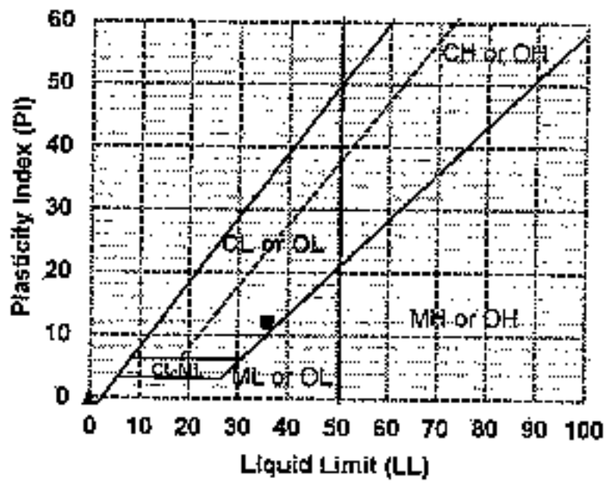
Client	:	Rudy Koekemoer cc	**Client Reference**	:	Portion 2 of 49 Willow Glen	
Address	:	21 Boca Walk	**Order Number**	:	N/A	
	:	Highveld Extension 7				
	:	Centurion, 0169				
Attention	:	Rudy Koekemoer	**Date Received**	:	27/05/2021	
E-mail	:	rkcc@vodamail.co.za	**Date Tested**	:	27/05/2021	- 15/06/2021
Project	:	Portion 2 of 49 Willow Glen	**Date Reported**	:	16/06/2021	
Job Number	:	S0619	**Report Status**	:	Final	

SAMPLE INFORMATION AND PROPERTIES		
Sample Number	661 ●	▲
Sample Position	TP 7	
Client Marking	TP 7	
Sample Depth (m)	0,9 - 1,2m	
Sample Container	Plastic Bag	
Condition of Sample	Good	
Sample Size / Weight (g)	±10kg	
Description of Sample	-	
Colour	-	
Type	-	
Sampled By	Client	
SANS 3001-GR1 and SANS 3001-GR3 (Hydrometer)		
Sieve Apertue Size (mm)	Percentage Passing Nearest 1%	
100	100	
75	100	
63	100	
50	100	
37,5	100	
28	100	
20	100	
14	100	
5	99	
2	83	
1	54	
0,425	25	
0,250	16	
0,150	11	
0,075	8	
0,051 ● / 0,055 ▲	7	
0,027 / 0,029	5	
0,015 / 0,016	3	
0,007 / 0,008	2	
0,002 / 0,003	1	
SANS 3001-PR5		
Soil-mortar (%)	83,0	
Coarse sand soil-mortar (%)	69,9	
Fine sand soil-mortar (%)	20,5	
Coarse fine sand soil-mortar (%)	10,8	
Medium fine sand soil-mortar (%)	6,0	
Fine fine sand soil-mortar (%)	3,6	
Silt and clay soil-mortar (%)	9,6	
Coarse sand ratio	0,7	
Grading Modulus = GM	1,8	
SANS 3001-GR10		
Liquid Limit (%)	36	
Plastic Limit (%)	24	
Plasticity Index (%)	12	
Linear Shrinkage (%)	5,0	
Overall Plasticity Index (%)	3	
SANS 3001-GR20 and SANS 5844		
Moisture Content (%)	N/T	
Relative Density (kg/m³)	N/T	
SOIL CLASSIFICATIONS		
AASHTO (ASTM D3282)	A-2-6(0)	
USCS (ASTM D2487)	SW-SC	

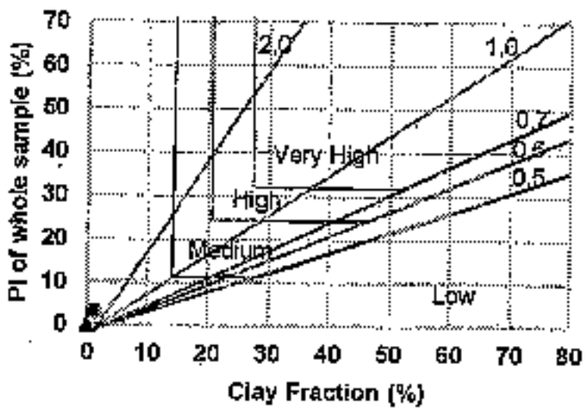
Plasticity Chart AASHTO



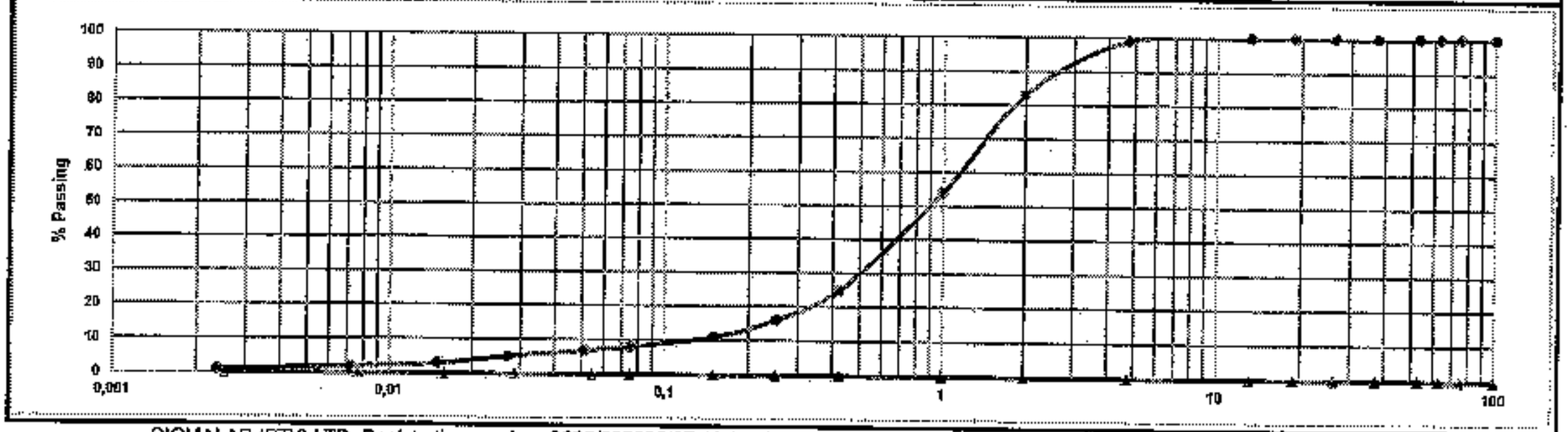
Casagrande Chart



Plasticity Chart: Van der Merwe



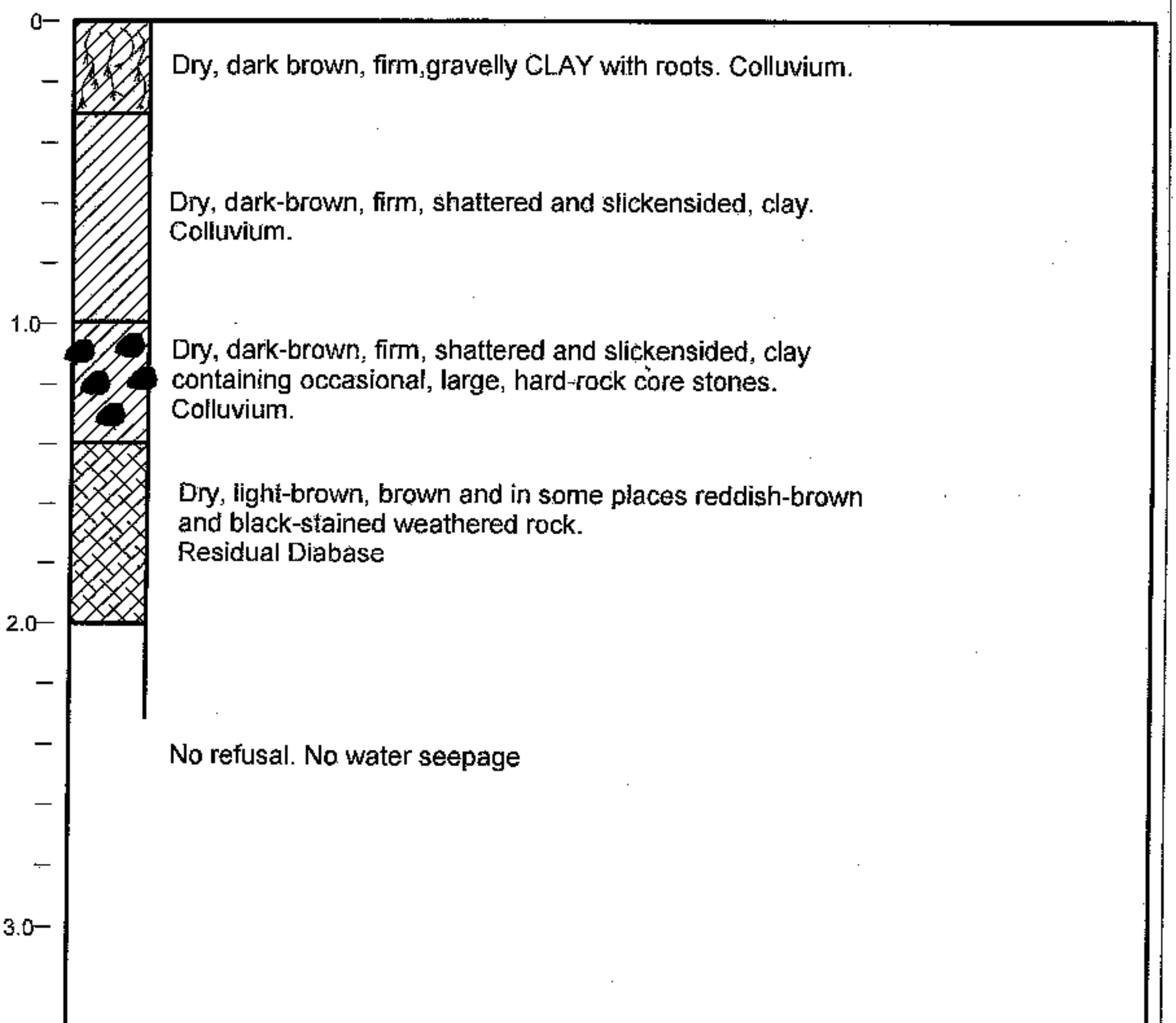
Remarks:



SOIL PROFILES

Client :	BASTION DEVELOPMENT GROUP
Property :	PORTION2 OF HOLDING 49 WILLOW GLEN AGRICULTURAL HOLDINGS
Site Address :	FURROW AVENUE
Date of Investigation :	26th MAY 2021

SOIL PROFILE - TEST PIT No. 01



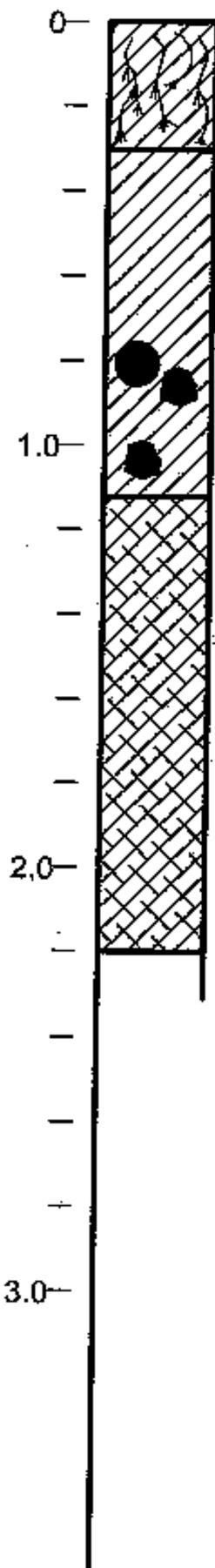
RUDY KOEKEMOER CC
CONSULTING ENGINEER

P O BOX 66342, HIGHVELD 1, 0169
TEL 012-665 4299
CELL PHONE 082 5656 538

Profiled by :	RK	TEST PIT POSITIONS ARE SHOWN ON THE SITE AND SOIL MAP TEST PIT COORDINATES ARE SHOWN ON THE SITE AND SOIL MAP	**TEST PIT No. 01**
Test Pit Type :	Trench		

Client :	BASTION DEVELOPMENT GROUP
Property :	PORTION2 OF HOLDING 49 WILLOW GLEN AGRICULTURAL HOLDINGS
Site Address :	FURROW AVENUE
Date of Investigation :	26th MAY 2021

SOIL PROFILE - TEST PIT No. 02



Dry, dark brown, firm,gravelly CLAY with roots. Colluvium.

Dry, dark-brown, firm, shattered and slickensided CLAY, containing occasional, large, hard-rock core stones. Colluvium.

Disturbed Sample @ 0.70 to 0.90 m [Lab. Ref. 659]

Dry, light-brown, brown and in some places reddish-brown and black-stained weathered rock.
Residual Diabase

No refusal. No water seepage

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CONSULTING ENGINEER

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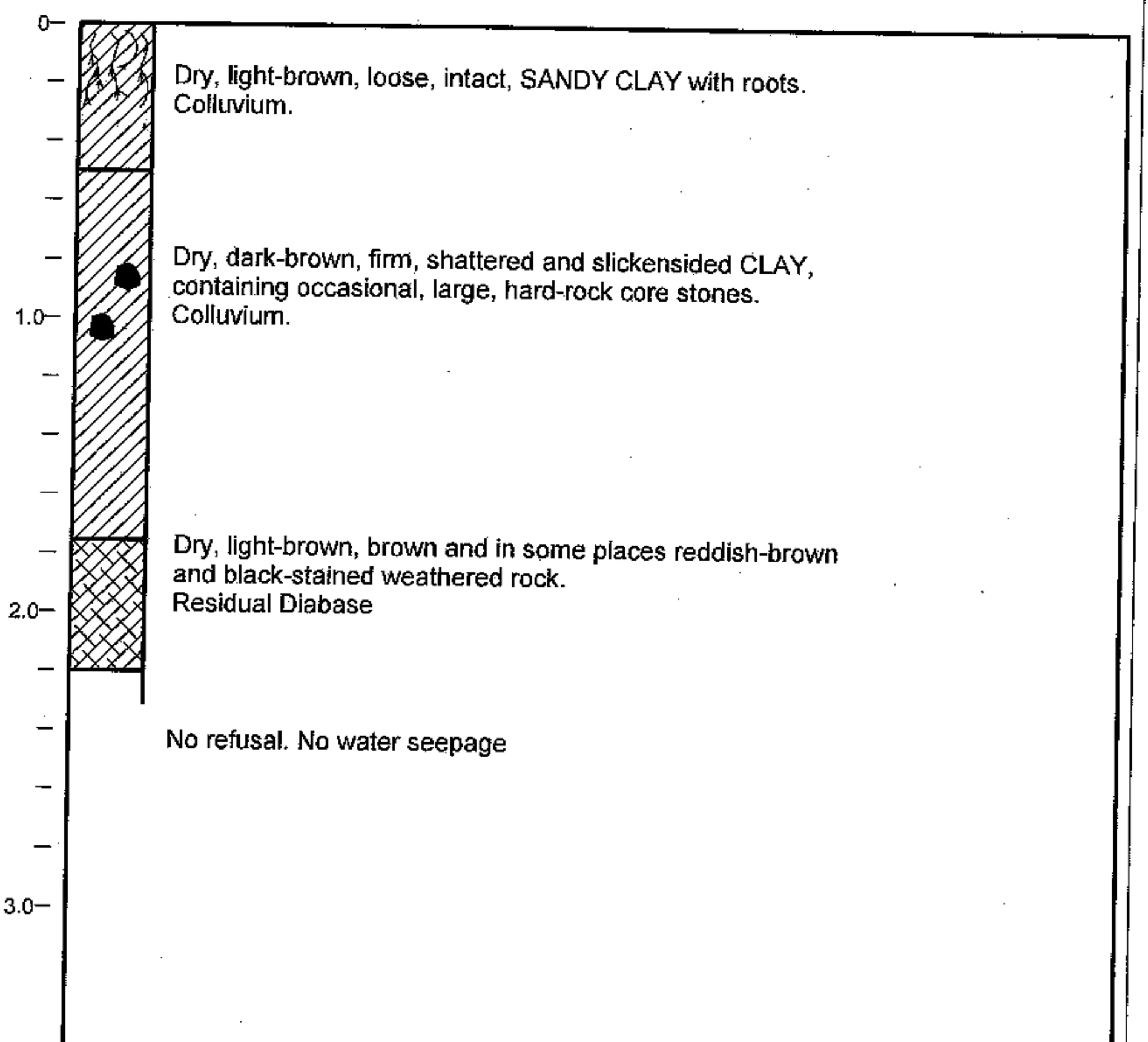
TEL 012-665 4299
CELL PHONE 082 5656 538

Profiled by : RK Test Pit Type : Trench	TEST PIT POSITIONS ARE SHOWN ON THE SITE AND SOIL MAP TEST PIT COORDINATES ARE SHOWN ON THE SITE AND SOIL MAP	**TEST PIT No. 02**

Client :	BASTION DEVELOPMENT GROUP
Property :	PORTION2 OF HOLDING 49 WILLOW GLEN AGRICULTURAL HOLDINGS
Site Address :	FURROW AVENUE
Date of Investigation :	26th MAY 2021

SOIL PROFILE - TEST PIT No. 03



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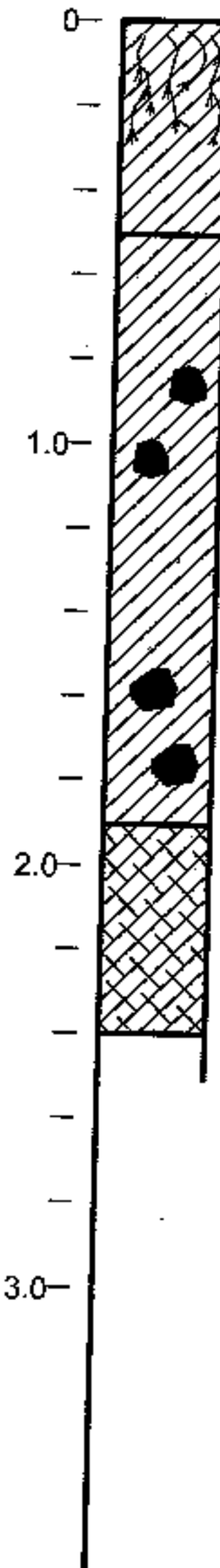
CELL PHONE 082 5656 538

Profiled by : RK Test Pit Type : Trench	TEST PIT POSITIONS ARE SHOWN ON THE SITE AND SOIL MAP TEST PIT COORDINATES ARE SHOWN ON THE SITE AND SOIL MAP	**TEST PIT No. 03**

Client :	BASTION DEVELOPMENT GROUP
Property :	PORTION2 OF HOLDING 49 WILLOW GLEN AGRICULTURAL HOLDINGS
Site Address :	FURROW AVENUE
Date of Investigation :	26th MAY 2021

SOIL PROFILE - TEST PIT No. 04



Dry, brown, loose, intact, SANDY CLAY with roots. Colluvium.

Dry, dark-brown, firm, shattered and slickensided CLAY, containing occasional, large, hard-rock core stones. Colluvium.

Dry, light-brown, brown and in some places reddish-brown and black-stained weathered rock.
Residual Diabase

No refusal. No water seepage

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CONSULTING ENGINEER

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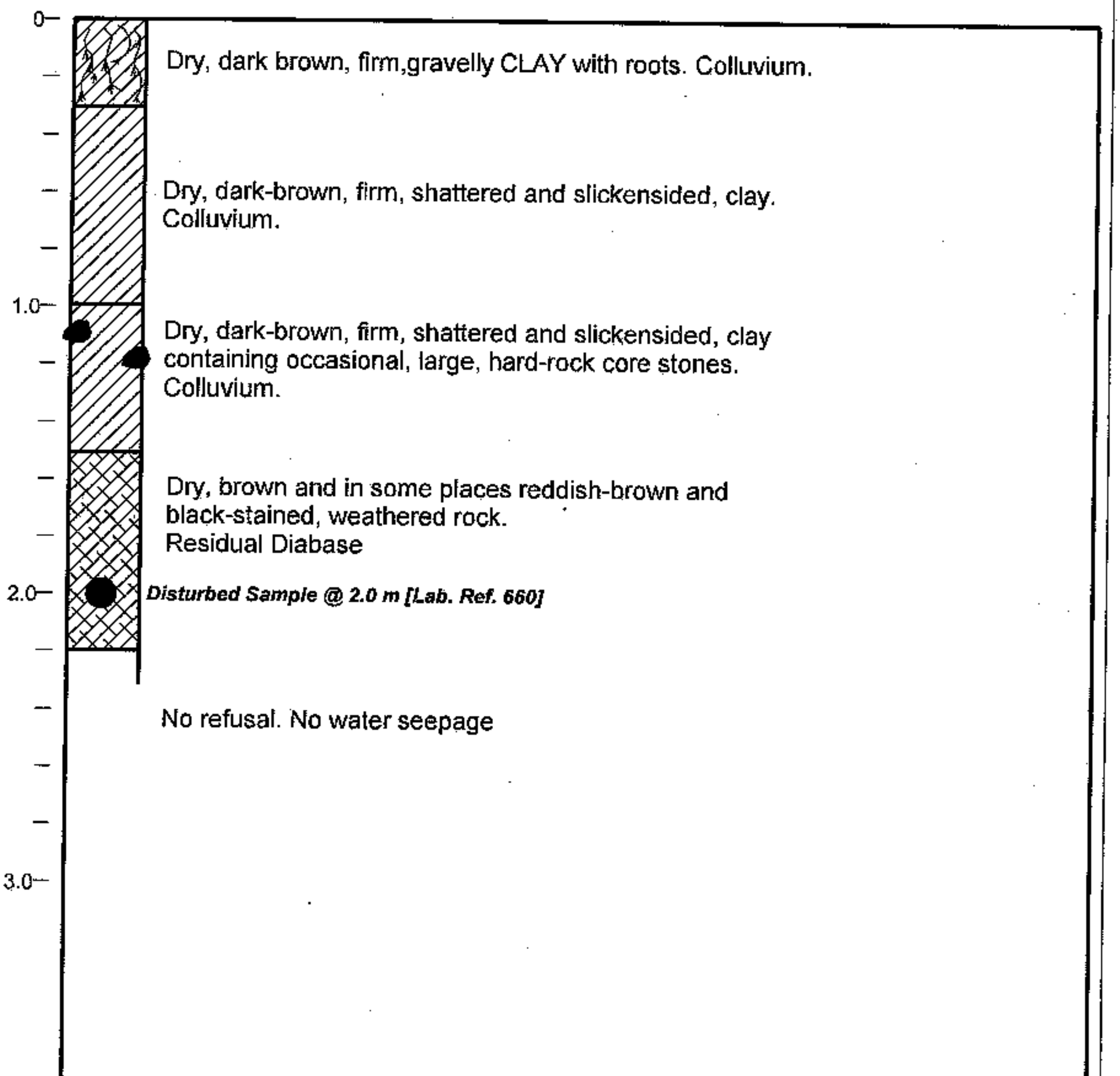
Profiled by :	RK	TEST PIT POSITIONS ARE SHOWN ON THE SITE AND SOIL MAP	**TEST PIT No. 04**
Test Pit Type :	Trench	TEST PIT COORDINATES ARE SHOWN ON THE SITE AND SOIL MAP	

Client :	BASTION DEVELOPMENT GROUP
Property :	PORTION2 OF HOLDING 49 WILLOW GLEN AGRICULTURAL HOLDINGS
Site Address :	FURROW AVENUE
Date of Investigation :	26th MAY 2021

SOIL PROFILE - TEST PIT No. 05



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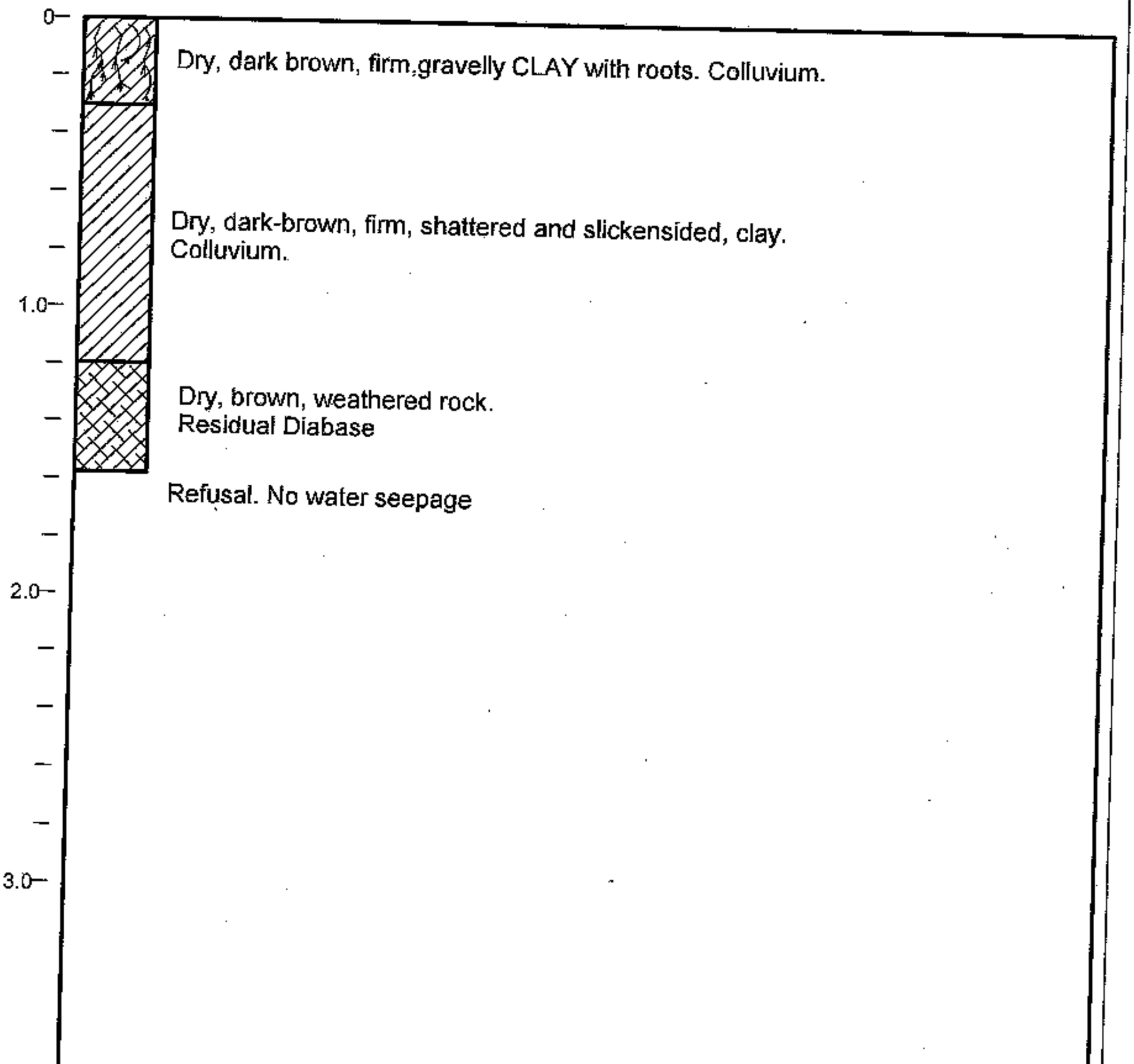
CELL PHONE 082 5656 538

Profiled by :	RK	TEST PIT POSITIONS ARE SHOWN ON THE SITE AND SOIL MAP TEST PIT COORDINATES ARE SHOWN ON THE SITE AND SOIL MAP	**TEST PIT No. 05**
Test Pit Type :	Trench		

Client :	BASTION DEVELOPMENT GROUP
Property :	PORTION2 OF HOLDING 49 WILLOW GLEN AGRICULTURAL HOLDINGS
Site Address :	FURROW AVENUE
Date of Investigation :	26th MAY 2021

SOIL PROFILE - TEST PIT No. 06



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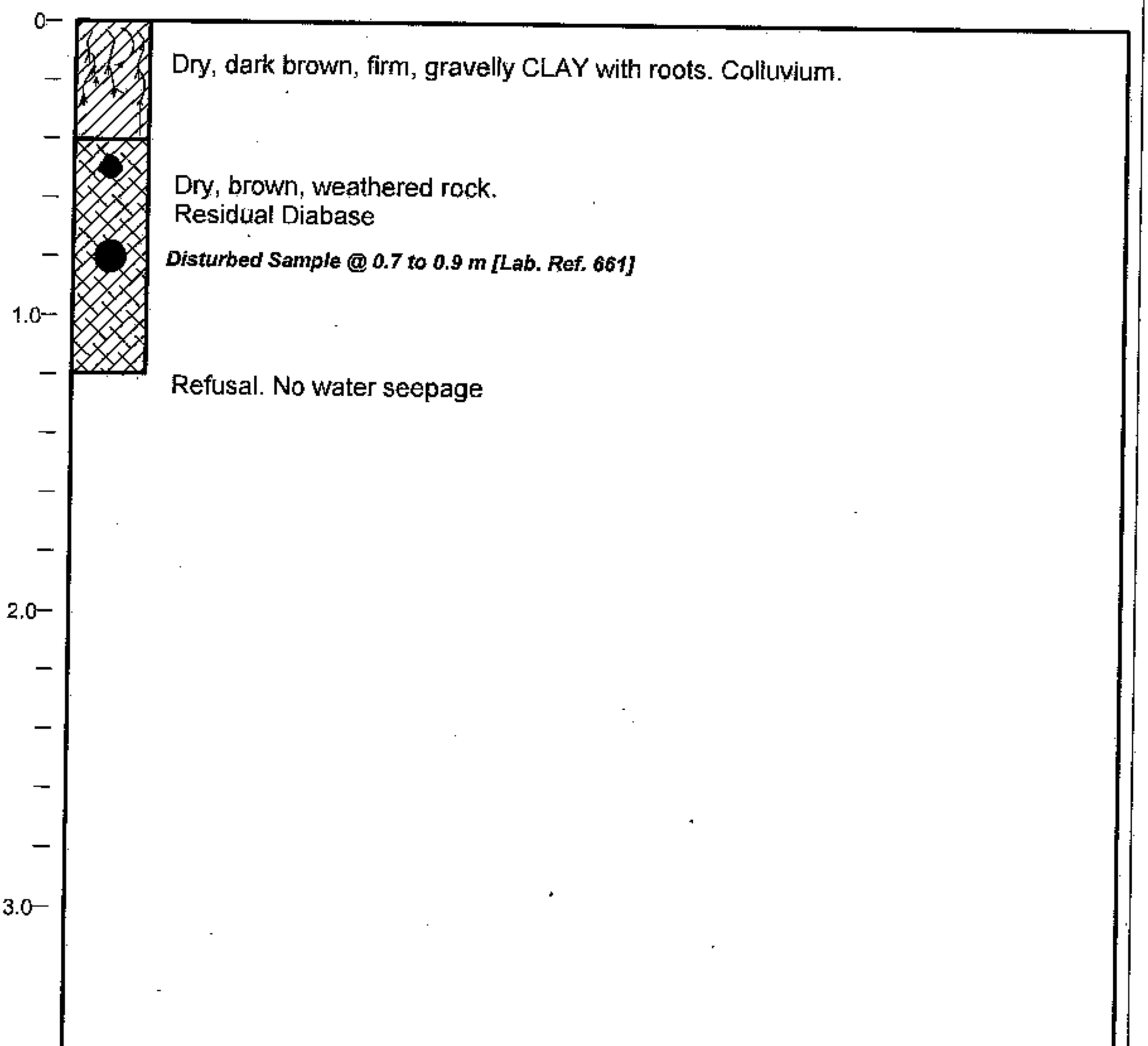
Profiled by :	RK	TEST PIT POSITIONS ARE SHOWN ON THE SITE AND SOIL MAP TEST PIT COORDINATES ARE SHOWN ON THE SITE AND SOIL MAP	**TEST PIT No. 06**
Test Pit Type :	Trench		

Client :	BASTION DEVELOPMENT GROUP
Property :	PORTION2 OF HOLDING 49 WILLOW GLEN AGRICULTURAL HOLDINGS
Site Address :	FURROW AVENUE
Date of Investigation :	26th MAY 2021

SOIL PROFILE - TEST PIT No. 07



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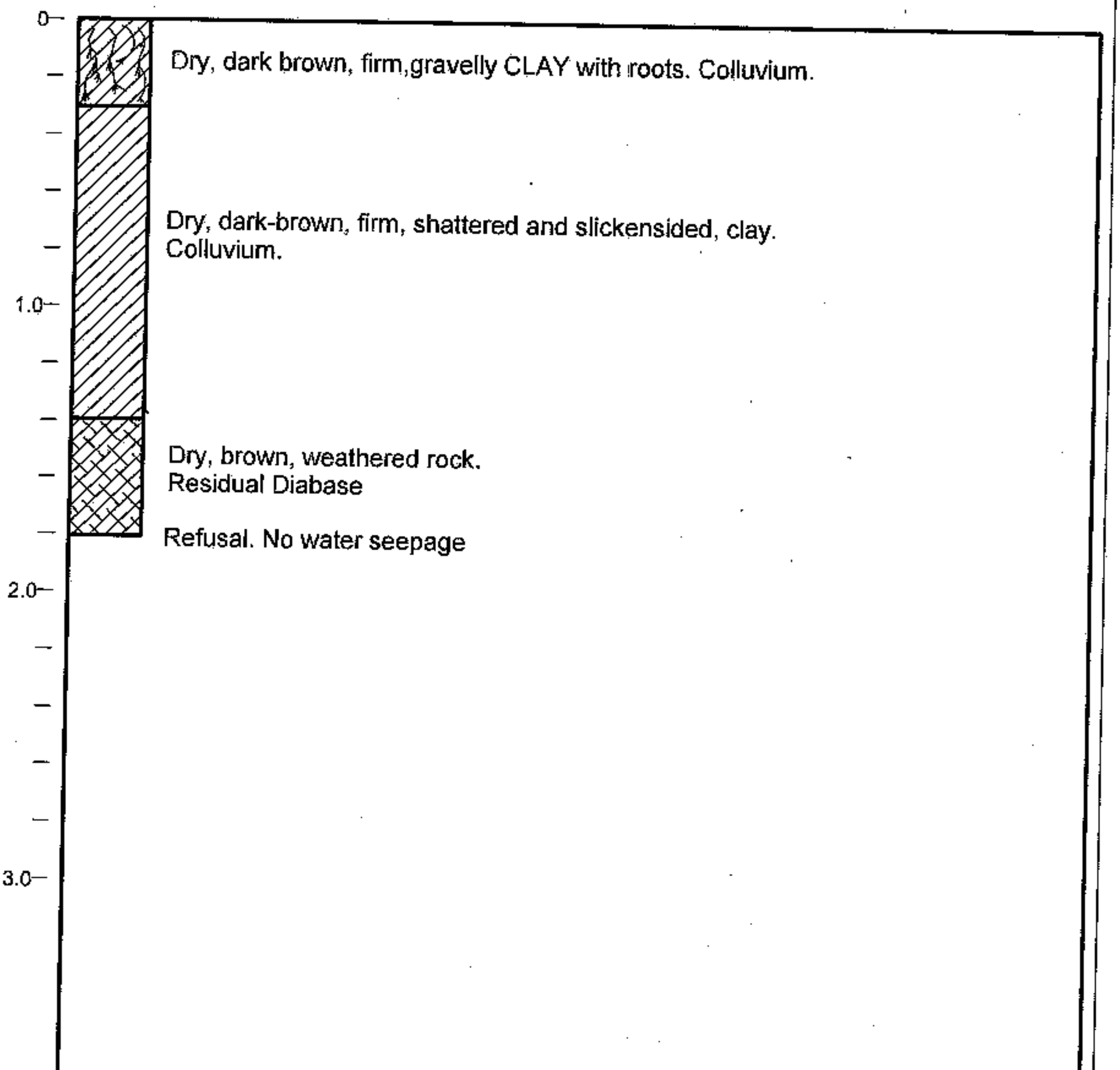
Profiled by :	RK	TEST PIT POSITIONS ARE SHOWN ON THE SITE AND SOIL MAP TEST PIT COORDINATES ARE SHOWN ON THE SITE AND SOIL MAP	**TEST PIT No. 07**
Test Pit Type :	Trench		

Client :	BASTION DEVELOPMENT GROUP
Property :	PORTION2 OF HOLDING 49 WILLOW GLEN AGRICULTURAL HOLDINGS
Site Address :	FURROW AVENUE
Date of Investigation :	26th MAY 2021

SOIL PROFILE - TEST PIT No. 08



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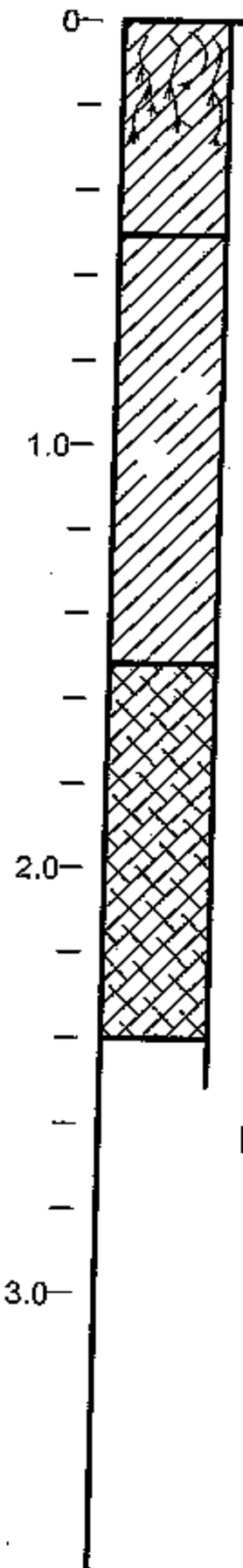
Profiled by :	RK	TEST PIT POSITIONS ARE SHOWN ON THE SITE AND SOIL MAP TEST PIT COORDINATES ARE SHOWN ON THE SITE AND SOIL MAP	**TEST PIT No. 08**
Test Pit Type :	Trench		

Client :	BASTION DEVELOPMENT GROUP
Property :	PORTION2 OF HOLDING 49 WILLOW GLEN AGRICULTURAL HOLDINGS
Site Address :	FURROW AVENUE
Date of Investigation :	26th MAY 2021

SOIL PROFILE - TEST PIT No. 09



Dry, brown, loose, intact, SANDY CLAY with roots. Colluvium.

Dry, dark-brown, firm, shattered and slickensided CLAY, containing occasional, large, hard-rock core stones. Colluvium.

Refusal. No water seepage

RUDY KOEKEMOER CC
CONSULTING ENGINEER

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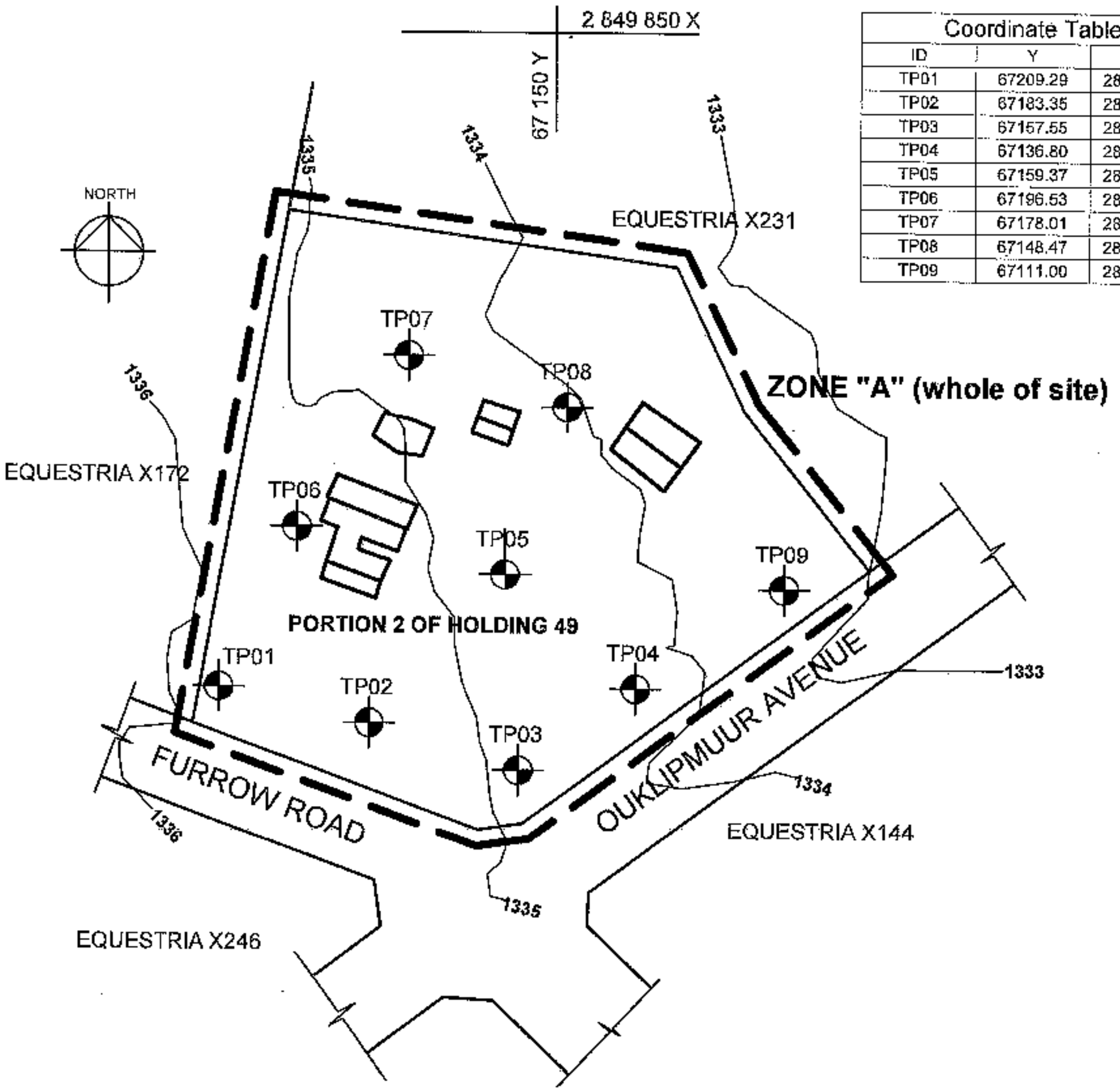
Profiled by : RK Test Pit Type : Trench	TEST PIT POSITIONS ARE SHOWN ON THE SITE AND SOIL MAP TEST PIT COORDINATES ARE SHOWN ON THE SITE AND SOIL MAP	**TEST PIT No. 09**

SITE AND SOIL MAP



Coordinate Table		
ID	Y	X
TP01	67209.29	2849964.34
TP02	67183.35	2849969.53
TP03	67157.55	2849978.22
TP04	67136.80	2849963.50
TP05	67159.37	2849943.59
TP06	67196.53	2849935.31
TP07	67178.01	2849906.21
TP08	67148.47	2849914.90
TP09	67111.00	2849946.95

SITE ZONE	GENERAL MATERIAL DESCRIPTION	NHBRC SITE CLASS
A	Dark brown, firm, shattered, slickensided clay. Colluvium.	H2

LEGEND

TP01 — Test pit by backactor, approximate position and number. Value in brackets is the depth at refusal, if any.

Inferred boundaries between different site zones

Note
Soil boundaries are inferred and should be considered as a gradual change from one soil zone to the next, to be determined more accurately during installation of service trenches or by additional excavations during foundation installation or by DCP tests.

TYPICAL ABRIDGED SOIL PROFILE

SITE PLAN and SOIL MAP

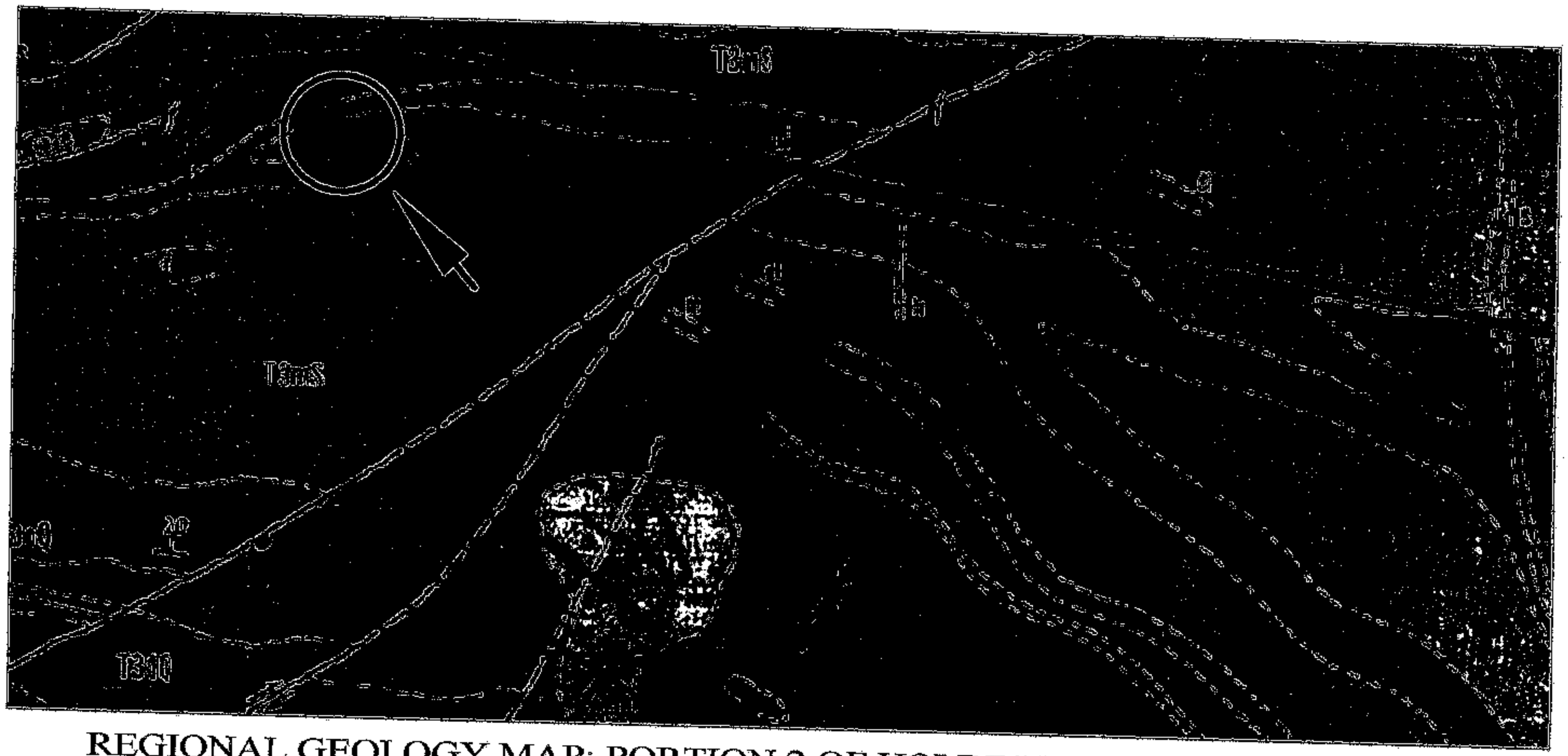
SITE AREA = 1.0000 ha

1 : 1000

0 — 50 — 100

PROJECT	DEVELOPER	CONSULTANT	TITLE OF THIS DRAWING
GEOTECHNICAL INVESTIGATION AND REPORT PROPOSED DEVELOPMENT OF PORTION 2 OF HOLDING 49 WILLOW GLEN AGRICULTURAL HOLDINGS, PRETORIA	BASTION DEVELOPMENT GROUP 70 MOTOR CRESCENT SILVERTON PRETORIA	RUDY KOEKEMOER CC Consulting Civil Engineer PO BOX 66342 HIGHVELD 0169 082 565 6538	SITE PLAN and SOIL MAP DATE: JUNE 2021 CONSULTANT'S DRAWING No.: 2021-01-G-01

REGIONAL GEOLOGY MAP



REGIONAL GEOLOGY MAP: PORTION 2 OF HOLDING 49, WILLOW GLEN AH

SITE AREA = 1.00 hectares

LEGEND

THE SITE

T3mS : Shale, partly carbonaceous, calcareous layers and agglomerate

di : diabase and various other granophyric basic rocks.

PROJECT	DEVELOPER	CONSULTANT	TITLE OF THIS DRAWING
GEOTECHNICAL INVESTIGATION AND REPORT for the DEVELOPMENT OF PORTION 2 OF HOLDING 49 WILLOW GLEN AGRICULTURAL HOLDINGS, PRETORIA	BASTION DEVELOPMENT GROUP 70 MOTOR CRESCENT SILVERTON	RUDY KOEKEMOER CC Consulting Civil Engineer PO BOX 66342 HIGHVELD 082 565 6538 0169 012-665 4299	REGIONAL GEOLOGY MAP
			DATE: June 2021 / CONSULTANT'S DRAWING No.: 2021-01-G2