REPORT

ON THE ENGINEERING GEOLOGICAL INVESTIGATION OF THE PROPOSED PHOKENG TOWNSHIP DEVELOPMENT WITHIN THABONG, WELKOM AS PART OF THE MATJHABENG MUNICIPALITY IN THE FREE STATE PROVINCE.

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July 2013

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REPORT ON THE ENGINEERING GEOLOGICAL INVESTIGATION OF THE PROPOSED PHOKENG TOWNSHIP DEVELOPMENT WITHIN THABONG, WELKOM AS PART OF THE MATJHABENG MUNICIPALITY IN THE FREE STATE PROVINCE.

1. INTRODUCTION:

Wessel Badenhorst (RoadlabPrehabJV (Pty) Ltd.) was appointed by Phethogo Consulting (Bloemfontein), respresented by Mr. Piet de Bie, to do an engineering geological investigation report on the above mentioned project for the determination of the suitability of the *in situ* material to be used as backfill material, the excavatability of the *in situ* material and the suitability of the investigation area for the proposed development. The investigation was undertaken according to the normal requirements for residential developments, as specified by the NHBRC for first phase development.

The following aspects were addressed in this report:

1.1 Geology and soil profiles
1.2 Geohydrology
1.3 Geotechnical conditions and recommendations

2. AVAILABLE INFORMATION

The following information was available: Site location, coordinates and a preliminary location plan indicating possible positions for the test pits to be excavated. The final test pit coordinates were determined based on the approximation of the test pit locations and are indicated on the laboratory test results and test pit profiles.

3. LOCALITY AND SITE DESCRIPTION

The site is located between Thabong Ext 12 and Thabong Ext 15, East of Welkom within the Municipal Area of the Mathjabeng Municipality in the North of the Free State Province.

The site encompasses a total of approximately 95 ha, situated approximately 10km east of the CBD of Welkom. Access to the site is gained via the M4 and the R70, which intersects with the N1, by taking a turn-off to the left (unknown street) just before entering Riebeeckstad.

Figure 1: *Site Layout Plan (Google Earth)*

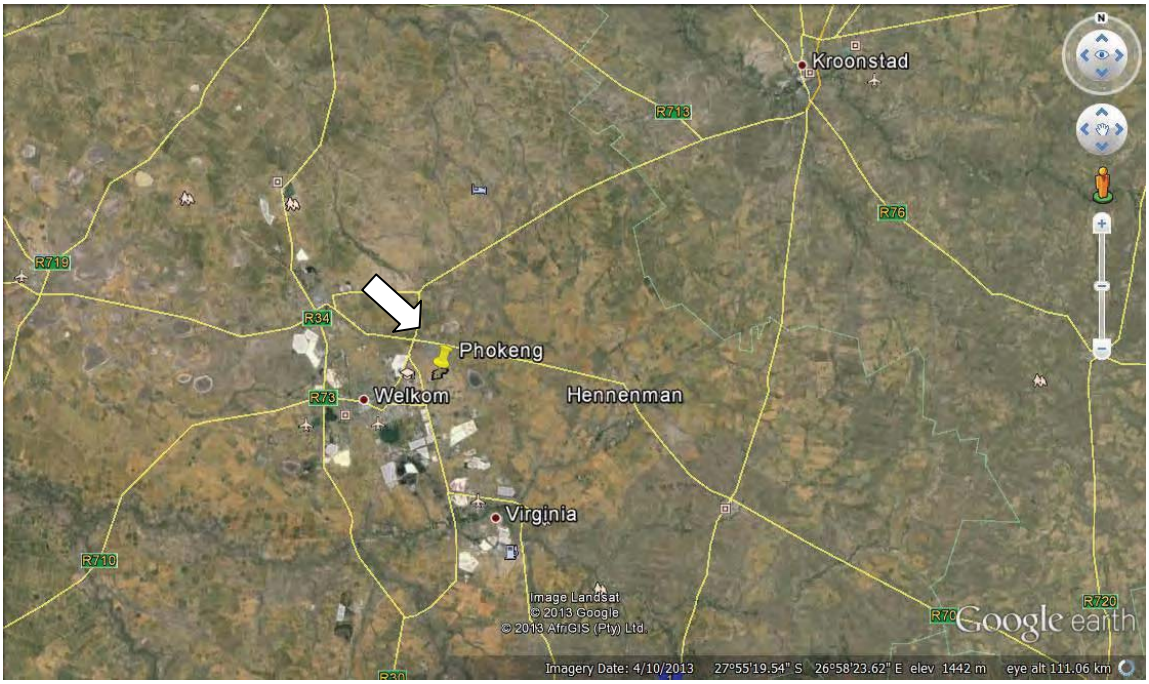


Figure 2: *Site Location Plan (Google Earth)*

Currently a small part of the site is occupied as part of an informal settlement. Typically the site is covered with grass and small shrubs with the exception of some trees. The slope of the site seems relatively flat with the exception of the area in close proximity to the stream dividing the eastern and western sections of the area. The location of services on the site is unknown and was not encountered during the investigation.

4. TOPOGRAPHY AND DRAINAGE

With a large majority of the slope being relatively flat, drainage is a possible concern. It is recommended that a contour map be utilised to determine the best possible design in terms of drainage. It is to be ensured that the drainage provided on site should be sufficient in terms of its general requirements and design life. The site is located at an approximate altitude of 1371m above mean average sea level.

5. METHOD OF INVESTIGATION

The exact area of the investigation is unknown. Eleven (11) test pits were excavated to approximately cover the proposed development area. The test pits were excavated with a TLB (8ton) and the soil profiles were described according to the standard method proposed by Jennings, Brink and Williams (1973).

The test pit positions are indicated by GPS coordinates on the Profiles.

Disturbed samples of the most prominent soil horizons were taken and submitted for foundation indicator, and CBR tests. Undisturbed samples were taken to determine whether collapsibility is a possible concern. All test results are attached as Annexure B.

6. GEOLOGY AND SOIL PROFILE

The site is underlain by Adelaide Formation (Pa) of the Beaufort Group (Karoo Supergroup) consisting mainly of sandstone and mudstone. The site investigation showed that the site is mainly underlain by mudstone.

Aeolian deposits also occur on the site. These refer to silts and sands transported by wind. Aeolian deposits often pertain to collapsible or compressible material.

The area is classified as having a climatic N-value (after Weinert) between 2 and 5, which indicates chemical and mechanical weathering as the main forms of weathering.

Greyish brown and orange silty sands and clayey sands were typically encountered on site with weathered and decomposed mudstone encountered in some of the test pits. Calcrete was encountered in several of the test pits. This was recorded in the attached soil profiles included as Annexure A.

7. GEOHYDROLOGY

Excluding the stream dividing the site, no ground or surface water was encountered during the investigation.

The climate around Welkom is essentially continental one with warm, wet summers and relatively cold winters. The average summer maximum is 31.3°C and the average winter minimum is 2.3°C. The average annual rainfall varies between 250mm and 500mm. Welkom is a moderate climatic region with a Weinert N-Value between 2 and 5.

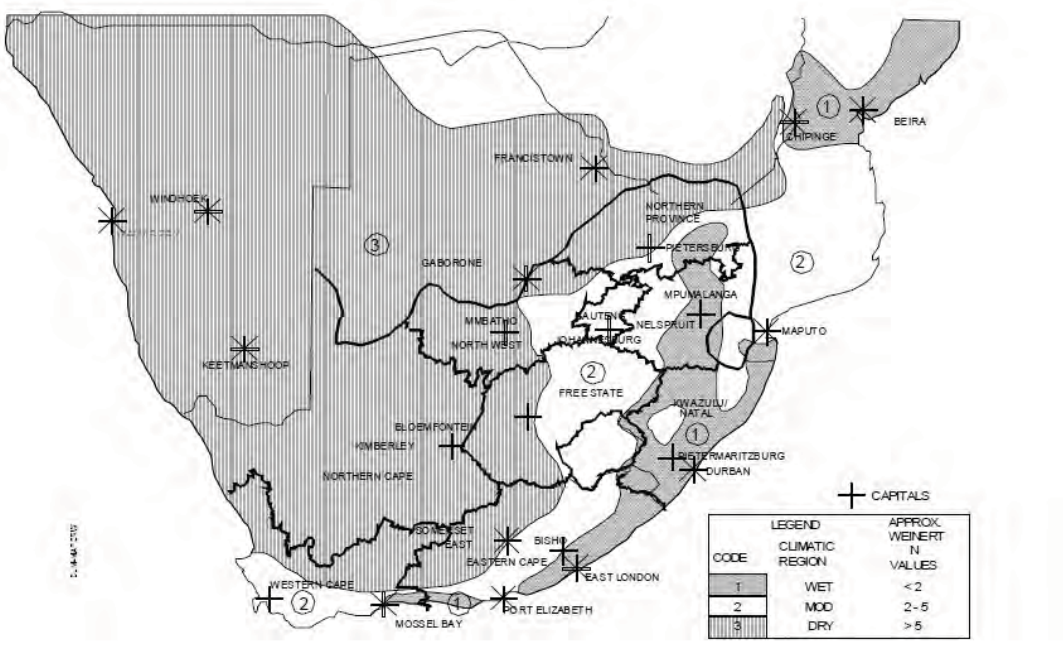


Figure 3: *Macro Climatic Regions of South Africa – Taken from TRH3:2007 – adapted from Weinert, 1980*

8. LABORATORY TEST RESULTS

8.1 The laboratory test results are attached as Annexure B.

8.2 **Potential expansiveness:** The potential expansiveness of the materials encountered on the site was calculated based on the method suggested by Van der Merwe (1964) and revised by Savage (2007). The following material characteristics are considered when applying this method:

- Clay content
- Plasticity index
- Liquid limit
- Linear shrinkage

The method of Van der Merwe (1964) was used to determine the potential heave of soil samples. In addition to Van der Merwe's method, the plasticity index and linear shrinkage of soil samples were used to indicate the soils potential expansiveness.

From the laboratory test results the potential expansiveness of the soils on the site is **considered as medium.** (Please refer to figure 2, taken from "Identification of Problematic soils in Southern Africa" by the Department of Public Works – 2007.

***Table 1**: Potential Expansiveness*

Test Pit	Depth (mm)	Plasticity Index	0.02mm Material Fraction	* Potential Expansiveness	* Estimated Differential Heave (van der Merwe, 1964)
Test Pit 1	0 – 300	7	25	Low	0.0mm
	300 – 1600	19	25	Medium	16.7mm
	1600 – 2100	15	18	Medium	4.5mm
Test Pit 2	400 – 2000	3	9	Low	0.0mm
	2000 – 2500	4	20	Low	0.0mm
Test Pit 3	1000 – 2000	6	24	Low	0.0mm
Test Pit 4	300 – 1200	9	15	Low	0.0mm
	1200 – 2500	10	14	Low	0.0mm
Test Pit 5	1100 – 2500	6	27	Low	0.0mm
Test Pit 6	800 – 1700	9	27	Low	0.0mm
Test Pit 7	300 – 1600	6	27	Low	0.0mm
Test Pit 9	200 – 700	7	29	Low	0.0mm
	700 – 3000	11	9	Low	0.0mm

Test Pit	Depth (mm)	Plasticity Index	0.02mm Material Fraction	* Potential Expansiveness	* Estimated Differential Heave (van der Merwe, 1964)
Test Pit 10	800 – 2200	10	21	Low	0.0mm
	2200 – 3000	9	20	Low	0.0mm

Maximum Potential heave for any Test Pit is **20.2mm.**

* Based on van der Merwe (1964) – Improved by Savage (2007)

8.3 Excavatability of ground

Excavatability is defined as the ease with which the ground can be excavated to a depth of 3.0m. This is of importance for urban development as increased costs are associated with installing services or foundations in areas where difficulty is experienced with excavation. According to the test pits excavated on site, excavations up to a depth of 2.1meter should generally be feasible. The TLB used generally had no difficulty reaching depths up to 2.1meter, as indicated in the test pit profiles (Annexure A).

8.4 Collapse potential

Collapsible soils are soils, which can withstand relatively large imposed stresses with small settlements at low in situ moisture content but will decrease in volume causing relatively larger settlements when wetting occurs under a load. This volume change is associated with a change in the structure of the soil and can occur in any open structured silty sandy soils with a high void ratio. Colluvial soils situated on straight slopes, plains and residual soil are well drained and exhibit a low collapsibility.

Due to the nature of the soil, collapsibility and compressibility is a concern. It is recommended that the transported material found in the first 500mm is saturated with water and compacted with an impact roller or rammer to ensure a collapse prior to the construction of any structures. Refer to Figure 3, taken from “Identification of Problematic soils in Southern Africa” by the Department of Public Works – 2007.

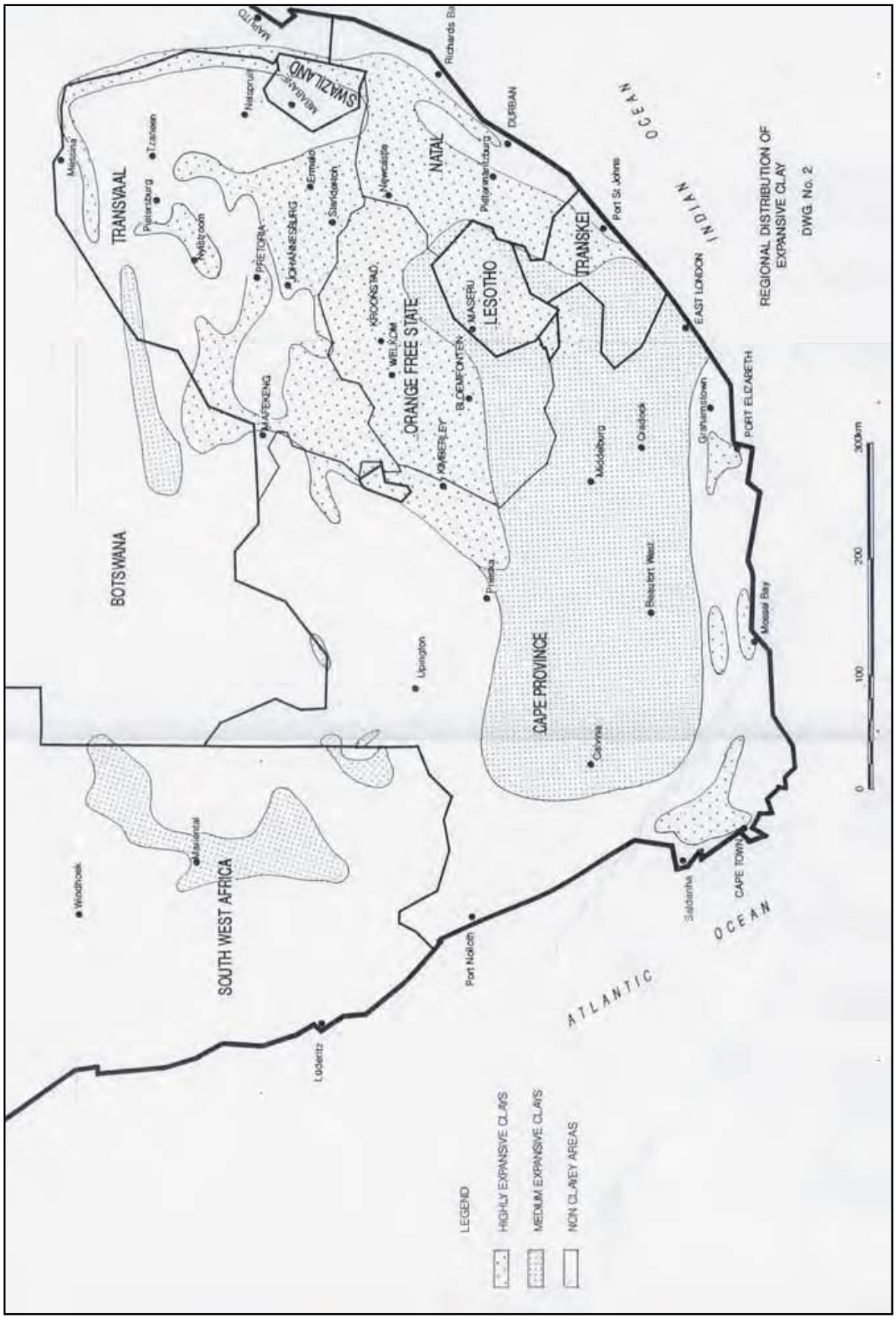


Figure 4: *Regional Distribution of Expansive Clay*

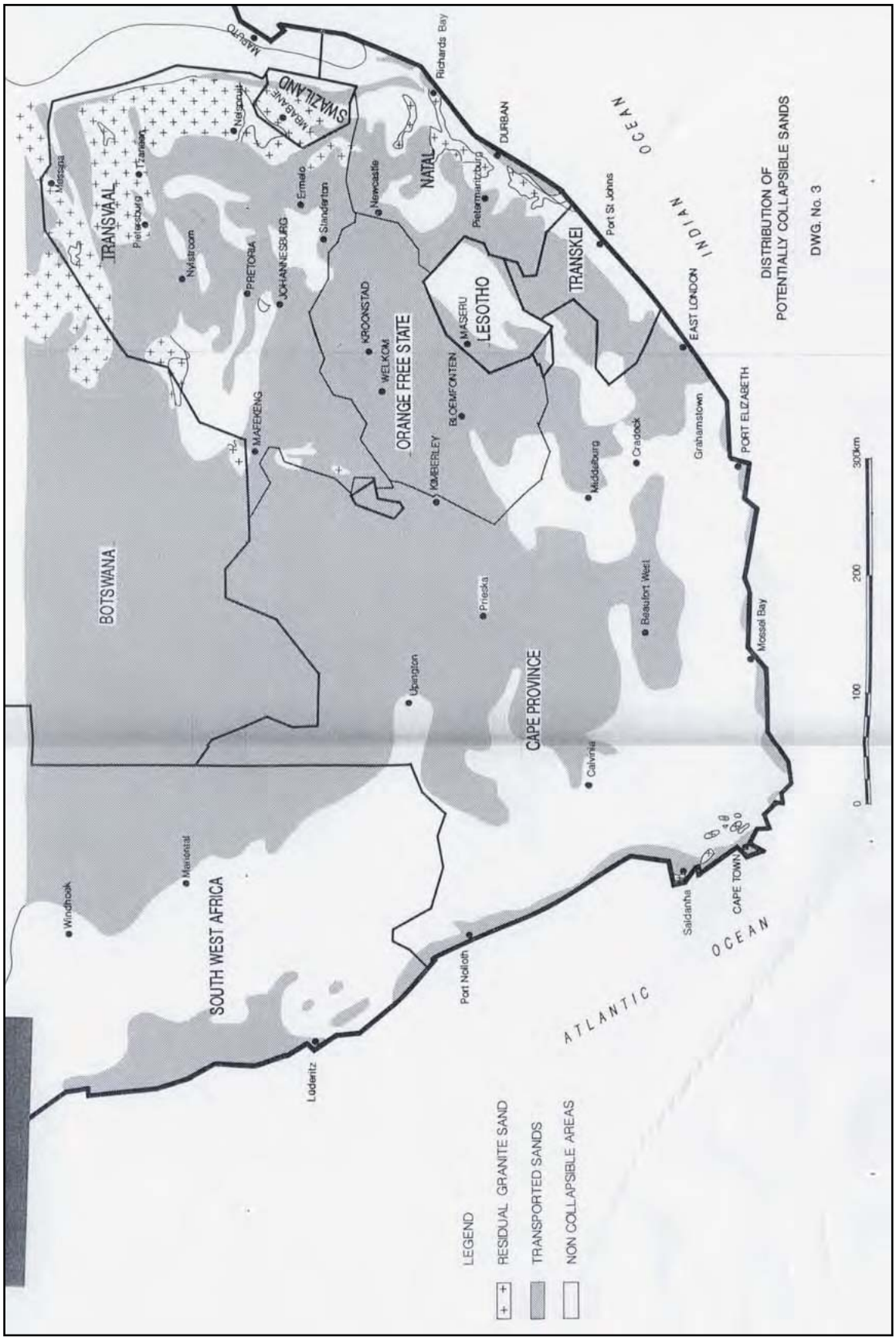


Figure 5: *Distribution of Potentially Collapsible Sands*

8.5 Compressibility

Given ideal conditions such as saturated moisture content and applied load, the soil will be compressible to a certain degree.

8.6 Erodibility

The erosion of soils is a function of the resistance of slope materials to entrainment and transport, and the potential of slope processes that promotes erosion. The resistance of soil to erosion is also related to the mechanical strength, cohesion and particle size of the material self. No erosion was evident during the investigation.

8.6 Dispersivity

A dispersive soil is prone to the desegregation or separation of clay particles from the soil mass on contact with water. These soils can be identified in the field by the presence of erosion gullies, piping and areas of stunted growth. The Emerson Crumb test can be used to identify the dispersivity of soil samples by determining the tendency of soil particles to deflocculate and go into suspension. There was no evidence of dispersivity on this site. No tests for dispersivity were done on the material sampled.

Dispersion can occur in any given soil with a high percentage of exchangeable sodium percentage (ESP), causing internal erosion and eventually piping through embankment dams. The tendency for dispersive erosion in a given soil depends upon such variables as the mineralogy and chemistry of the clay and the dissolved salts in the soil water and the eroding water.

8.7 Ground slope instability

This refers to an area comprising unstable geological materials that can move either gradually (creep) or suddenly as a slump or a slide. The risk of movement is determined by factors such as the nature of the slope (solid rock, colluvial material), gradient of slope, role of water, type and nature of vegetation cover, seismicity and impact of human

activities such as undermining of a slope. No such characteristics were observed during the investigation. The site and the gradient of slope is gentle and relatively flat.

8.8 California Bearing Ratio Tests (CBR)

Seven (7) CBR tests were done and the results can be summarised as follows:

***Table 2**: CBR Values*

Test Pit	Depth (mm)	Californian Bearing Ratio at 95% MOD AASHTO
Test Pit 1	0 – 300	8
	300 – 1600	2
	1600 – 2100	1
Test Pit 4	1200 – 2500	2
Test Pit 6	800 – 1700	1
Test Pit 10	800 – 2200	15
	2200 – 3000	10

The CBR Values are reasonably low, which indicates a relatively low bearing capacity estimated in the vicinity of 40 – 150 kPa.

9. ENGINEERING GEOLOGICAL ZONING

Based on the following summaries (Table 1 and Table 3), the NHBRC site zoning is:

Site Class C1/H2/P – See Annexure E

The particle size analysis of the material on site is as follows: (Table 3)

Test Pit No.	Layer Thickness (mm)	Gravel >4.750mm	Sand >0.075-4.750mm	Silt >0.002-0.075mm	Clay <0.002mm
Test Pit 1	0 – 300	0	46	29	25
	300 – 1600	0	39	36	25
	1600 – 2100	2	47	33	18
Test Pit 2	400 – 2000	4	61	26	9
	2000 – 2500	0	59	21	20
Test Pit 3	1000 – 2000	4	61	11	24
Test Pit 4	300 – 1200	17	42	26	15

Test Pit No.	Layer Thickness (mm)	Gravel >4.750mm	Sand >0.075-4.750mm	Silt >0.002-0.075mm	Clay <0.002mm
Test Pit 4	1200 – 2500	22	45	19	14
Test Pit 5	1100 – 2600	3	59	11	27
Test Pit 6	800 – 1700	0	65	8	27
Test Pit 7	300 – 1600	10	58	5	27
Test Pit 9	200 – 700	0	63	8	29
	700 – 3000	42	41	8	9
Test Pit 10	800 – 2200	16	53	10	21
	2200 – 3000	9	52	19	20

Classification C refers to silty sands, sands, sandy and gravelly soils. Classification C1 refers to a total estimated settlement between 5.0mm and 10.0mm. Differential settlement equals approximately 75% of the total settlement expected.

Classification H refers to fine grained soils with moderate to very high plasticity, clayey sand, clay and other clay variant soils. Classification H2 refers to a total estimated heave between 15.0mm and 30.0mm. Classification H1 refers to a total estimated heave between 7.5mm and 15.0mm.Differential heave equals approximately 50% of the total settlement expected.

Classification P refers to problem areas that should preferably be avoided. The area marked P in this case refers to the area that falls within the buffer for the 1:100 year flood.

(Reference: Home Building Manual, Part1, Section2, Table1: Residential site class designations)

10. GEOTECHNICAL CONSIDERATIONS

The following geotechnical considerations that could influence the proposed development were identified:

10.1 ***Site Class H2/C1 :*** *(Stiffened or cellular raft, Piled Construction, Soil raft), Stiffened or cellular raft of articulated lightly reinforced masonry,*
Or

Piled construction – Piled foundation with suspended floor slabs with or without ground beams,

Or

Soil raft - Remove all or necessary parts of expansive horizon to 1.0m beyond the perimeter of the building and replace with inert backfill compacted to 93% MOD AASHTO density at -1% to +2% optimum moisture content. Normal construction with light reinforced strip footings with light reinforcement in masonry if residual movement is < 7.5mm, or construction type appropriate to residual movements.

10.2 Excavatability: Medium excavations can be expected on site – Refer to Annexure A. ***No blasting operations are foreseen. However an excavator might need to be used with some of the harder materials.***

10.3 Soil classification: The typical material found on site is silty sand with potential heave estimated as low, although some materials are deemed to be medium (test pit 1). Although it is not clear that expansive materials occur across the entire site, Welkom is deemed to have prevalent heaving clays. This is a factor which must be considered during the design phase.

10.4 Groundwater: No ground water was encountered during the investigation.

10.5 Stability of slopes and excavations: The sides of the test pits did not appear to fall in; therefore the excavations appear to be stable.

10.6 It is recommended that no development takes place within the 100-year flood parameter.

10.7 The site conditions seem favourable for the proposed township development, subject to the aforementioned considerations.

11. REFERENCES

FIGURES:

Figure 1: Obtained from Google Earth – www.google.com/earth

Figure 2: Obtained from Google Earth – www.google.com/earth

Figure 3: Taken from TRH3:2007, adopted from Weinert 1980.

Figures 4 & 5: South African Institute for Engineering and Environmental Geologists. (2000) *A Short Workshop on Suggested Interpretation Techniques of Soil Movement*. Stellenbosch Business School.

OTHER REFERENCES:

1.) Van der Merwe D. (1964) The Prediction of Heave from the Plasticity Index and Percentage Clay Fraction of Soils. *Civil Engineer in South Africa June 1964*.

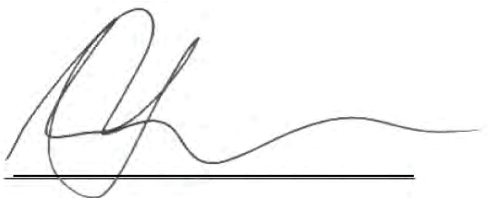
2.) Jennings, J E B, Brink, A B A and Williams A A B. (1973) Revised Guide to Soil Profiling for Civil Engineering Purposes in Southern Africa. *The Civil Engineer in S A, p 3-12. January 1973.*

3.) Weinert H H,(1980) The Natural Road Construction Materials of Southern Africa *Academica, Cape Town.*

4.) National Department of Housing: Geotechnical Site Investigations for Housing Developments – Generic Specifications GFSH-2, table 3 page 27, published in September 2002.

5.) NHBRC - Home Building Manual, Part1, Section2, Table1: Residential site class designations

6.) Savage P.F.(2007) Evaluation of Possible Swelling Potential of Soil *Proceedings of the 26th S A Transport Conference July 2007.*



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Annexure A:
Soil profiles

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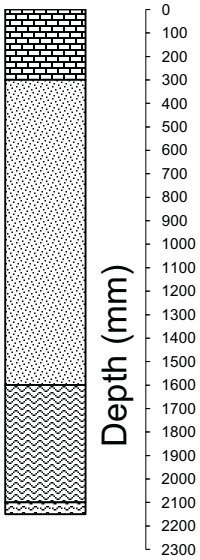
Civil Engineering Material Testing Laboratories

Test Pit : 1 **Coordinates:** 27 Y0018192 X3092939 **Date Profiled:** 25/06/2013

CLIENT: Phethogo Consulting
PROJECT: Geotechnical Investigation, Phokeng, Welkom

Starting Depth: 0mm
End Depth: 2100mm



0 - 300mm	Slightly moist light brown medium dense intact sandy silt (transported).
300 - 1600mm	Slightly moist light brown stiff shattered sandy clay .
1600 - 2100mm	Slightly moist grey very stiff shattered sandy clay (residual) with calcrete particles.
+ 2100mm	Refusal on very dense pedogenic material.

Disturbed Samples:
Sample 1A taken at 150mm.
Sample 1B taken at 950mm.
Sample 1C taken at 1850mm.

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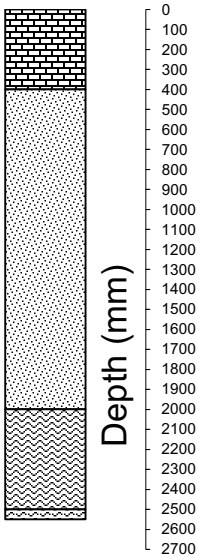
Test Pit : 2 **Coordinates:** 27 Y0018244 X3093218 **Date Profiled:** 25/06/2013

CLIENT: Phethogo Consulting
PROJECT: Geotechnical Investigation, Phokeng, Welkom

Starting Depth: 0mm
End Depth: 2500mm



0 - 400mm	Slightly moist light brown medium dense intact silty sand (transported).
400 - 2000mm	Moist orange medium dense intact silty sand .
2000 - 2500mm	Moist yellowish brown medium dense clast-supported silty sand (residual).
+ 2500mm	Refusal on very dense pedogenic material.

Disturbed Samples:
Sample 2A taken at 1200mm.
Sample 2B taken at 2250mm.

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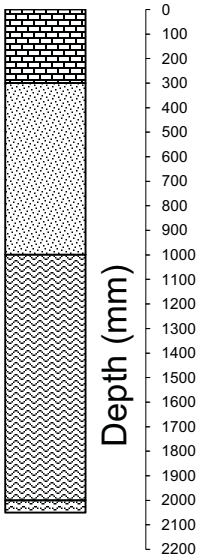
Test Pit : 3 **Coordinates:** 27 Y0018224 X3093519 **Date Profiled:** 25/06/2013

CLIENT: Phethogo Consulting
PROJECT: Geotechnical Investigation, Phokeng, Welkom

Starting Depth: 0mm
End Depth: 2000mm



0 - 300mm	Slightly moist light brown medium dense intact silty sand (transported).
300 - 1000mm	Slightly moist light brown medium dense clast-supported silty sand.
1000 - 2000mm	Slightly moist yellowish brown very dense clast-supported silty sand (residual).
+ 2000mm	Refusal on very dense pedogenic material.

Disturbed Samples:
Sample 3A taken at 1500mm.

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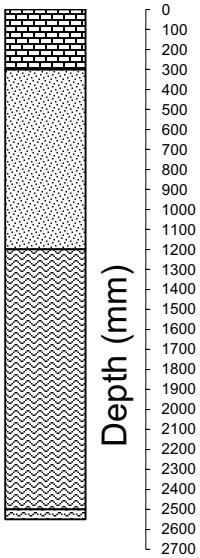
Test Pit : 4 **Coordinates:** 27 Y0017914 X3093448 **Date Profiled:** 25/06/2013

CLIENT: Phethogo Consulting
PROJECT: Geotechnical Investigation, Phokeng, Welkom

Starting Depth: 0mm
End Depth: 2500mm



0 - 300mm	Slightly moist light brown medium dense intact silty sand (transported).
300 - 1200mm	Slightly moist light brown medium dense shattered silty sand .
1200 - 2500mm	Slightly moist grey very dense shattered silty sand (residual).
+ 2500mm	Refusal on very dense pedogenic material.

Disturbed Samples:
Sample 4A taken at 750mm.
Sample 4B taken at 1850mm.

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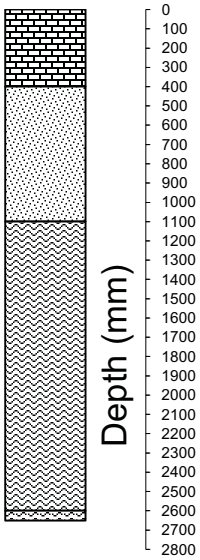
Test Pit : 5 **Coordinates:** 27 Y0017948 X3093162 **Date Profiled:** 25/06/2013

CLIENT: Phethogo Consulting
PROJECT: Geotechnical Investigation, Phokeng, Welkom

Starting Depth: 0mm
End Depth: 2600mm



0 - 400mm	Slightly moist light brown medium dense intact silty sand (transported).
400 - 1100mm	Slightly moist light brownish grey dense shattered silty sand (residual).
1100 - 2600mm	Slightly moist light brown mixed with grey very dense clayey sand (residual).
+ 2600mm	Refusal on very dense pedogenic material.

Disturbed Samples:
Sample 5A taken at 1850mm.

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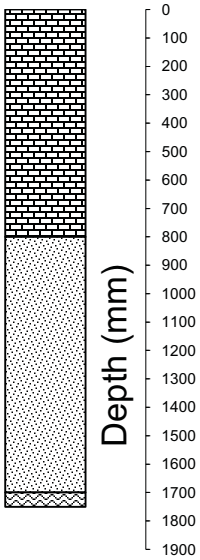
Test Pit : 6 **Coordinates:** 27 Y0017916 X3092873 **Date Profiled:** 25/06/2013

CLIENT: Phethogo Consulting
PROJECT: Geotechnical Investigation, Phokeng, Welkom

Starting Depth: 0mm
End Depth: 1700mm



0 - 800mm	Slightly moist light brown medium dense intact sandy silt (transported).
800 - 1700mm	Slightly moist yellowish brown very dense clast-supported silty sand (residual).
+ 1700mm	Refusal on very dense pedogenic material.

Disturbed Samples:
Sample 6A taken at 1250mm.

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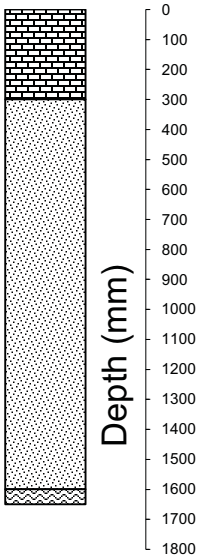
Test Pit : 7 **Coordinates:** 27 Y0017683 X3092745 **Date Profiled:** 25/06/2013

CLIENT: Phethogo Consulting
PROJECT: Geotechnical Investigation, Phokeng, Welkom

Starting Depth: 0mm
End Depth: 1600mm



0 - 300mm	Slightly moist light brown medium dense intact sandy silt (transported).
300 - 1600mm	Slightly moist orange brown very dense shattered silty sand (residual).
+ 1600mm	Refusal on very dense pedogenic material.

Disturbed Samples:
Sample 7A taken at 950mm.

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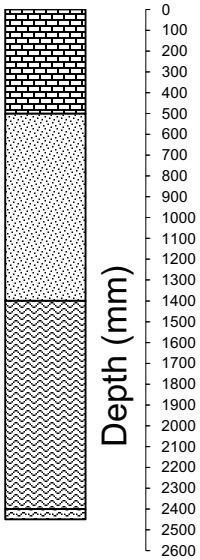
Test Pit : 8 **Coordinates:** 27 Y0017656 X3093004 **Date Profiled:** 25/06/2013

CLIENT: Phethogo Consulting
PROJECT: Geotechnical Investigation, Phokeng, Welkom

Starting Depth: 0mm
End Depth: 2400mm



0 - 500mm	Slightly moist light brown medium dense intact sandy silt (transported).
500 - 1400mm	Slightly moist reddish brown medium dense clast-supported sandy silt.
1400 - 2400mm	Slightly moist yellowish brown very dense clast-supported silty sand (residual).
+ 2400mm	Refusal on very dense pedogenic material.

Disturbed Samples:
No Samples Taken

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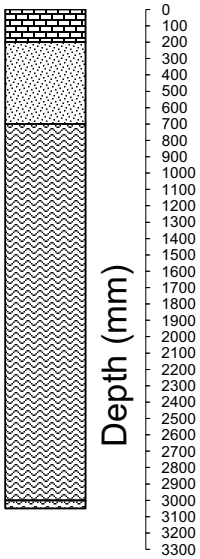
Civil Engineering Material Testing Laboratories

Test Pit : 9 **Coordinates:** 27 Y0017629 X3093271 **Date Profiled:** 25/06/2013

CLIENT: Phethogo Consulting
PROJECT: Geotechnical Investigation for Phokeng

Starting Depth: 0mm
End Depth: 3000mm



0 - 200mm	Slightly moist light brown medium dense intact sandy silt (transported).
200 - 700mm	Slightly moist reddish brown medium dense clast-supported silty sand .
700 - 3000mm	Slightly moist yellowish grey dense shattered silty sand (residual).
+ 3000mm	Slightly moist yellowish grey dense shattered silty sand (residual).

Disturbed Samples:
Sample 9A taken at 450mm.
Sample 9B taken at 1850mm.

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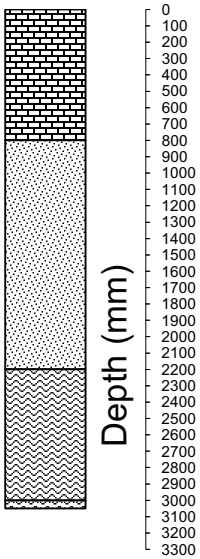
Civil Engineering Material Testing Laboratories

Test Pit : 10 **Coordinates:** 27 Y0017135 X3092944 **Date Profiled:** 25/06/2013

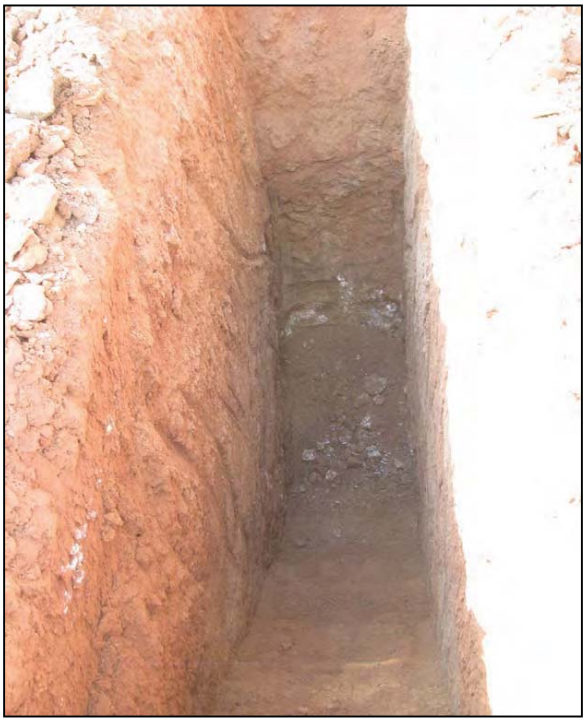
CLIENT: Phethogo Consulting
PROJECT: Geotechnical Investigation, Phokeng, Welkom

Starting Depth: 0mm
End Depth: 3000mm



0 - 800mm	Moist orange medium dense intact silty sand (transported).
800 - 2200mm	Moist dark greyish brown medium dense silty sand .
2200 - 3000mm	Wet olive brown medium dense shattered silty sand (residual).
+ 3000mm	Wet olive brown medium dense shattered silty sand (residual).

Disturbed Samples:
Sample 10A taken at 1500mm.
Sample 10B taken at 2600mm.



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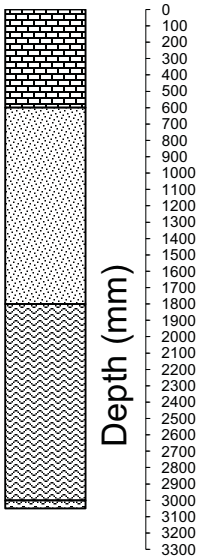
Test Pit : 11 **Coordinates:** 27 Y0017060 X3092838 **Date Profiled:** 25/06/2013

CLIENT: Phethogo Consulting
PROJECT: Geotechnical Investigation, Phokeng, Welkom

Starting Depth: 0mm
End Depth: 3000mm



0 - 600mm	Moist orange medium dense intact silty sand (transported).
600 - 1800mm	Moist dark greyish brown medium dense silty sand .
1800 - 3000mm	Wet olive brown medium dense shattered silty sand (residual).
+ 3000mm	Wet olive brown medium dense shattered silty sand (residual).

Disturbed Samples:
No Samples Taken

Annexure B:
Laboratory test results

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Civil Engineering Material Testing Laboratories

Our Referrence: Phokeng / 001 /13 / Ind Cbr **Req No : None** **Order No : None** **Date** **24 /06 /2013**

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ATTENTION: **Mr. Piet De Bie**

Test Report : **Geotechnical Investigation, Phokeng, Welkom**

Please find the attached test results for the sample/s as submitted to and tested by Roadlab / Prehab JV in Bloemfontein.
The unambiguous description of the sample/s as received are as follows :

SAMPLE No.		P616 / 13	P617 / 13	P618 / 13	
CONTAINER USED FOR SAMPLING		Sampling Bag	Sampling Bag	Sampling Bag	
SIZE / WEIGHT OF SAMPLE		± 70 Kg	± 70 Kg	± 70 Kg	
MOISTURE CONDITION OF		Slightly Moist	Slightly Moist	Slightly Moist	
HOLE No. / Km. / CHAINAGE		Test pit 1A	Test pit 1B	Test pit 1C	
COORDINATES					
LAYER TESTED / SAMPLED FROM		0 - 300mm	300 - 1600mm	1600 - 2100mm	
DATE RECEIVED		20 /03 /2013	20 /03 /2013	20 /03 /2013	
MATERIAL DESCRIPTION		Slightly moist light brown medium dense intact sandy silt (transported).	Slightly moist light brown stiff shattered sandy clay .	Slightly moist grey very stiff shattered sandy clay (residual) with calcrete particles.	
SIEVE ANALYSIS(mm) **(TMH A1a)**	75.0				
	63.0				
	53.0				
	37.5				
	26.5				
	19.0				
	13.2			100	
	4,75	100	100	98	
	2,00	90	95	91	
	0,425	78	92	81	
	0,075	54	61	51	
	0,002	25 / *16	25 / *30	18 / *23	
ATTERBERG LIMITS **(TMH A2&A3)**	LL%	24	41	35	
	P.I.	7	19	15	
	LS%	3.3	8.5	5.2	
GM - GRADING MODULES		0.78	0.52	0.77	
MOD AASHTO **(TMH A7)**	MDD kg/m^3	1915	1792	1808	
	OMC%	13.7	14.1	12.4	
Moulded density	MD1	99.6	100.2	100.9	
	MD2	93.9	94.7	94.3	
	MD3	89.2	89.3	89.7	
Swell %	S1	2.4	5.3	4.7	
	S2	3.3	6.3	6.2	
	S3	4.2	7.3	6.8	
C.B.R.	100	9	3	2	
(TMH A8)	98	9	3	2	
	97	8	2	2	
	95	8	2	1	
	93	7	2	1	
	90	6	1	1	
CLASSIFICATION	HRB				
	TRH 14				
	COLTO	Fill	Fill	Fill	

Kind Regards

Wessel Badenhorst
FOR ROADLAB / PREHAB JV

Remarks :

* 0.02mm Fraction calculated based on a paper by Savage (2007)
The samples were subjected to analysis according to TMH 1:1986 Methods A1(a), A2, A3, A5, A7, A8 and ASTM D422.
The results reported relate only to the sample tested

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Our Referrence: Phokeng / 002 /13 / Ind Cbr **Req No : None** **Order No : None** **Date** **24 /06 /2013**

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ATTENTION: **Mr. Piet De Bie**

Test Report : **Geotechnical Investigation, Phokeng, Welkom**

Please find the attached test results for the sample/s as submitted to and tested by Roadlab / Prehab JV in Bloemfontein.
The unambiguous description of the sample/s as received are as follows :

SAMPLE No.		P619/13	P620/13		
CONTAINER USED FOR SAMPLING		Sampling Bag	Sampling Bag		
SIZE / WEIGHT OF SAMPLE		± 70 Kg	± 70 Kg		
MOISTURE CONDITION OF		Slightly Moist	Slightly Moist		
HOLE No. / Km. / CHAINAGE		Test pit 2A	Test pit 2B		
COORDINATES					
LAYER TESTED / SAMPLED FROM		400 - 2000mm	2000 - 2500mm		
DATE RECEIVED		12 /03 /2013	12 /03 /2013		
MATERIAL DESCRIPTION		Moist orange medium dense intact silty sand .	Moist yellowish brown medium dense clast-supported silty sand (residual).		
SIEVE ANALYSIS(mm) **(TMH A1a)**	75.0				
	63.0				
	53.0				
	37.5				
	26.5				
	19.0				
	13.2	100			
	4,75	96	100		
	2,00	94	99		
	0,425	91	98		
	0,075	35	41		
	0,002	9 / *11	20 / *18		
ATTERBERG LIMITS **(TMH A2&A3)**	LL%	24	29		
	P.I.	3	4		
	LS%	1.7	1.5		
GM - GRADING MODULES		0.80	0.62		
MOD AASHTO **(TMH A7)**	MDD kg/m^3				
	OMC%				
Moulded density	MD1				
	MD2				
	MD3				
Swell %	S1				
	S2				
	S3				
C.B.R.	100				
(TMH A8)	98				
	97				
	95				
	93				
	90				
CLASSIFICATION	HRB				
	TRH 14				
	COLTO				

Kind Regards

Wessel Badenhorst
FOR ROADLAB / PREHAB JV

Remarks :

* 0.02mm Fraction calculated based on a paper by Savage (2007)
The samples were subjected to analysis according to TMH 1:1986 Methods A1(a), A2, A3, A5, A7, A8 and ASTM D422.
The results reported relate only to the sample tested

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Our Referrence: Phokeng / 003 /13 / Ind Cbr **Req No : None** **Order No : None** **Date 24 /06 /2013**

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ATTENTION: **Mr. Piet De Bie**

Test Report : **Geotechnical Investigation, Phokeng, Welkom**

Please find the attached test results for the sample/s as submitted to and tested by Roadlab / Prehab JV in Bloemfontein.
The unambiguous description of the sample/s as received are as follows :

SAMPLE No.		P621 / 13			
CONTAINER USED FOR SAMPLING		Sampling Bag			
SIZE / WEIGHT OF SAMPLE		± 70 Kg			
MOISTURE CONDITION OF		Slightly Moist			
HOLE No. / Km. / CHAINAGE		Test pit 3A			
COORDINATES					
LAYER TESTED / SAMPLED FROM		1000 - 2000mm			
DATE RECEIVED		12 /03 /2013			
MATERIAL DESCRIPTION		Slightly moist yellowish brown very dense clast-supported silty sand (residual).			
SIEVE ANALYSIS(mm) **(TMH A1a)**	75.0				
	63.0				
	53.0				
	37.5				
	26.5				
	19.0				
	13.2	100			
	4,75	96			
	2,00	94			
	0,425	91			
	0,075	35			
	0,002	24 / *18			
ATTERBERG LIMITS **(TMH A2&A3)**	LL%	24			
	P.I.	6			
	LS%	1.7			
GM - GRADING MODULES		0.80			
MOD AASHTO **(TMH A7)**	MDD kg/m^3				
	OMC%				
Moulded density	MD1				
	MD2				
	MD3				
Swell %	S1				
	S2				
	S3				
C.B.R.	100				
(TMH A8)	98				
	97				
	95				
	93				
	90				
CLASSIFICATION	HRB				
	TRH 14				
	COLTO				

Kind Regards

Wessel Badenhorst
FOR ROADLAB / PREHAB JV

Remarks :

* 0.02mm Fraction calculated based on a paper by Savage (2007)
The samples were subjected to analysis according to TMH 1:1986 Methods A1(a), A2, A3, A5, A7, A8 and ASTM D422.
The results reported relate only to the sample tested

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Our Referrence: Phokeng / 004 /13 / Ind Cbr **Req No : None** **Order No : None** **Date 24 /06 /2013**

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ATTENTION: **Mr. Piet De Bie**

Test Report : **Geotechnical Investigation, Phokeng, Welkom**

Please find the attached test results for the sample/s as submitted to and tested by Roadlab / Prehab JV in Bloemfontein.
The unambiguous description of the sample/s as received are as follows :

SAMPLE No.		P622 / 13	P623 / 13		
CONTAINER USED FOR SAMPLING		Sampling Bag	Sampling Bag		
SIZE / WEIGHT OF SAMPLE		± 70 Kg	± 70 Kg		
MOISTURE CONDITION OF		Slightly Moist	Slightly Moist		
HOLE No. / Km. / CHAINAGE		Test pit 4A	Test pit 4B		
COORDINATES					
LAYER TESTED / SAMPLED FROM		300 - 1200mm	1200 - 2500mm		
DATE RECEIVED		12 /03 /2013	12 /03 /2013		
MATERIAL DESCRIPTION		Slightly moist light brown medium dense shattered silty sand .	Slightly moist grey very dense shattered silty sand (residual).		
SIEVE ANALYSIS(mm) **(TMH A1a)**	75.0				
	63.0				
	53.0				
	37.5				
	26.5		100		
	19.0	100	96		
	13.2	95	87		
	4,75	83	78		
	2,00	75	73		
	0,425	71	68		
	0,075	41	33		
	0,002	15 / *23	14 / *24		
ATTERBERG LIMITS **(TMH A2&A3)**	LL%	38	41		
	P.I.	9	10		
	LS%	3.8	4.0		
GM - GRADING MODULES		1.13	1.26		
MOD AASHTO **(TMH A7)**	MDD kg/m^3		1881		
	OMC%		11.9		
Moulded density	MD1		99.7		
	MD2		94.2		
	MD3		88.9		
Swell %	S1		4.4		
	S2		5.4		
	S3		6.3		
C.B.R.	100		2		
(TMH A8)	98		2		
	97		2		
	95		2		
	93		1		
	90		1		
CLASSIFICATION	HRB				
	TRH 14				
	COLTO		Fill		

Kind Regards

Wessel Badenhorst
FOR ROADLAB / PREHAB JV

Remarks :

* 0.02mm Fraction calculated based on a paper by Savage (2007)
The samples were subjected to analysis according to TMH 1:1986 Methods A1(a), A2, A3, A5, A7, A8 and ASTM D422.
The results reported relate only to the sample tested

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Our Referrence: Phokeng / 005 /13 / Ind Cbr **Req No : None** **Order No : None** **Date** **24 /06 /2013**

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ATTENTION: **Mr. Piet De Bie**

Test Report : **Geotechnical Investigation, Phokeng, Welkom**

Please find the attached test results for the sample/s as submitted to and tested by Roadlab / Prehab JV in Bloemfontein.
The unambiguous description of the sample/s as received are as follows :

SAMPLE No.		P6234/ 13			
CONTAINER USED FOR SAMPLING		Sampling Bag			
SIZE / WEIGHT OF SAMPLE		± 70 Kg			
MOISTURE CONDITION OF		Slightly Moist			
HOLE No. / Km. / CHAINAGE		Test pit 5A			
COORDINATES					
LAYER TESTED / SAMPLED FROM		1100 - 2600mm			
DATE RECEIVED		12 /03 /2013			
MATERIAL DESCRIPTION		Slightly moist light brownish grey dense shattered silty sand (residual).			
SIEVE ANALYSIS(mm) **(TMH A1a)**	75.0				
	63.0				
	53.0				
	37.5				
	26.5				
	19.0				
	13.2	100			
	4,75	97			
	2,00	97			
	0,425	95			
	0,075	38			
	0,002	27 / *20			
ATTERBERG LIMITS **(TMH A2&A3)**	LL%	26			
	P.I.	6			
	LS%	3.3			
GM - GRADING MODULES		0.70			
MOD AASHTO **(TMH A7)**	MDD kg/m^3				
	OMC%				
Moulded density	MD1				
	MD2				
	MD3				
Swell %	S1				
	S2				
	S3				
C.B.R.	100				
(TMH A8)	98				
	97				
	95				
	93				
	90				
CLASSIFICATION	HRB				
	TRH 14				
	COLTO				

Kind Regards

Wessel Badenhorst
FOR ROADLAB / PREHAB JV

Remarks :

* 0.02mm Fraction calculated based on a paper by Savage (2007)
The samples were subjected to analysis according to TMH 1:1986 Methods A1(a), A2, A3, A5, A7, A8 and ASTM D422.
The results reported relate only to the sample tested

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Civil Engineering Material Testing Laboratories

Our Referrence: Phokeng / 006 /13 / Ind Cbr **Req No : None** **Order No : None** **Date** **24 /06 /2013**

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ATTENTION: **Mr. Piet De Bie**

Test Report : **Geotechnical Investigation, Phokeng, Welkom**

Please find the attached test results for the sample/s as submitted to and tested by Roadlab / Prehab JV in Bloemfontein.
The unambiguous description of the sample/s as received are as follows :

SAMPLE No.		P625/ 13			
CONTAINER USED FOR SAMPLING		Sampling Bag			
SIZE / WEIGHT OF SAMPLE		± 70 Kg			
MOISTURE CONDITION OF		Slightly Moist			
HOLE No. / Km. / CHAINAGE		Test pit 6A			
COORDINATES					
LAYER TESTED / SAMPLED FROM		800 - 1700mm			
DATE RECEIVED		12 /03 /2013			
MATERIAL DESCRIPTION		Slightly moist yellowish brown very dense clast-supported silty sand (residual).			
SIEVE ANALYSIS(mm) **(TMH A1a)**	75.0				
	63.0				
	53.0				
	37.5				
	26.5				
	19.0				
	13.2				
	4,75	100			
	2,00	98			
	0,425	85			
	0,075	35			
	0,002	27 / *19			
ATTERBERG LIMITS **(TMH A2&A3)**	LL%	26			
	P.I.	9			
	LS%	3.8			
GM - GRADING MODULES		0.82			
MOD AASHTO **(TMH A7)**	MDD kg/m^3	1865			
	OMC%	12.7			
Moulded density	MD1	99.9			
	MD2	95.3			
	MD3	89.7			
Swell %	S1	3.8			
	S2	4.9			
	S3	6.2			
C.B.R.	100	4			
(TMH A8)	98	3			
	97	2			
	95	1			
	93	1			
	90	0			
CLASSIFICATION	HRB				
	TRH 14				
	COLTO	Fill			

Kind Regards

Wessel Badenhorst
FOR ROADLAB / PREHAB JV

Remarks :

* 0.02mm Fraction calculated based on a paper by Savage (2007)
The samples were subjected to analysis according to TMH 1:1986 Methods A1(a), A2, A3, A5, A7, A8 and ASTM D422.
The results reported relate only to the sample tested

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Civil Engineering Material Testing Laboratories

Our Referrence: Phokeng / 007 /13 / Ind Cbr **Req No : None** **Order No : None** **Date** **24 /06 /2013**

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ATTENTION: **Mr. Piet De Bie**

Test Report : **Geotechnical Investigation, Phokeng, Welkom**

Please find the attached test results for the sample/s as submitted to and tested by Roadlab / Prehab JV in Bloemfontein.
The unambiguous description of the sample/s as received are as follows :

SAMPLE No.		P626/ 13			
CONTAINER USED FOR SAMPLING		Sampling Bag			
SIZE / WEIGHT OF SAMPLE		± 70 Kg			
MOISTURE CONDITION OF		Slightly Moist			
HOLE No. / Km. / CHAINAGE		Test pit 7A			
COORDINATES					
LAYER TESTED / SAMPLED FROM		300 - 1600mm			
DATE RECEIVED		12 /03 /2013			
MATERIAL DESCRIPTION		Slightly moist orange brown very dense shattered silty sand (residual).			
SIEVE ANALYSIS(mm) **(TMH A1a)**	75.0				
	63.0				
	53.0				
	37.5				
	26.5				
	19.0				
	13.2	100			
	4,75	90			
	2,00	86			
	0,425	84			
	0,075	32			
	0,002	27 / *18			
ATTERBERG LIMITS **(TMH A2&A3)**	LL%	25			
	P.I.	6			
	LS%	2.5			
GM - GRADING MODULES		0.98			
MOD AASHTO **(TMH A7)**	MDD kg/m^3				
	OMC%				
Moulded density	MD1				
	MD2				
	MD3				
Swell %	S1				
	S2				
	S3				
C.B.R.	100				
(TMH A8)	98				
	97				
	95				
	93				
	90				
CLASSIFICATION	HRB				
	TRH 14				
	COLTO				

Kind Regards

Wessel Badenhorst
FOR ROADLAB / PREHAB JV

Remarks :

* 0.02mm Fraction calculated based on a paper by Savage (2007)
The samples were subjected to analysis according to TMH 1:1986 Methods A1(a), A2, A3, A5, A7, A8 and ASTM D422.
The results reported relate only to the sample tested

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Our Referrence: Phokeng / 008 /13 / Ind Cbr **Req No : None** **Order No : None** **Date** **24 /06 /2013**

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9332

ATTENTION: **Mr. Piet De Bie**

Test Report : **Geotechnical Investigation, Phokeng, Welkom**

Please find the attached test results for the sample/s as submitted to and tested by Roadlab / Prehab JV in Bloemfontein.
The unambiguous description of the sample/s as received are as follows :

SAMPLE No.		P627/ 13	P628/ 13		
CONTAINER USED FOR SAMPLING		Sampling Bag	Sampling Bag		
SIZE / WEIGHT OF SAMPLE		± 70 Kg	± 70 Kg		
MOISTURE CONDITION OF		Slightly Moist	Slightly Moist		
HOLE No. / Km. / CHAINAGE		Test pit 9A	Test pit 9B		
COORDINATES					
LAYER TESTED / SAMPLED FROM		200 - 700mm	700 - 3000mm		
DATE RECEIVED		12 /03 /2013	12 /03 /2013		
MATERIAL DESCRIPTION		Slightly moist reddish brown medium dense clast-supported silty sand .	Slightly moist yellowish grey dense shattered silty sand (residual).		
SIEVE ANALYSIS(mm) **(TMH A1a)**	75.0				
	63.0				
	53.0				
	37.5				
	26.5				
	19.0		100		
	13.2		74		
	4,75	100	58		
	2,00	100	51		
	0,425	98	41		
	0,075	37	17		
	0,002	29 / *21	9 / *14		
ATTERBERG LIMITS **(TMH A2&A3)**	LL%	25	39		
	P.I.	7	11		
	LS%	3.3	5.1		
GM - GRADING MODULES		0.65	1.91		
MOD AASHTO **(TMH A7)**	MDD kg/m^3				
	OMC%				
Moulded density	MD1				
	MD2				
	MD3				
Swell %	S1				
	S2				
	S3				
C.B.R.	100				
(TMH A8)	98				
	97				
	95				
	93				
	90				
CLASSIFICATION	HRB				
	TRH 14				
	COLTO				

Kind Regards

Wessel Badenhorst
FOR ROADLAB / PREHAB JV

Remarks :

* 0.02mm Fraction calculated based on a paper by Savage (2007)
The samples were subjected to analysis according to TMH 1:1986 Methods A1(a), A2, A3, A5, A7, A8 and ASTM D422.
The results reported relate only to the sample tested

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Cell No : 082 570 2183

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Civil Engineering Material Testing Laboratories

Our Referrence: Phokeng / 009 /13 / Ind Cbr **Req No : None** **Order No : None** **Date** **24 /06 /2013**

Phethogo Consulting
PO Box 43284
Heuwelsig/Bloemfontein
9332

ATTENTION: **Mr. Piet De Bie**

Test Report : **Geotechnical Investigation, Phokeng, Welkom**

Please find the attached test results for the sample/s as submitted to and tested by Roadlab / Prehab JV in Bloemfontein.
The unambiguous description of the sample/s as received are as follows :

SAMPLE No.		P629/ 13	P630/ 13		
CONTAINER USED FOR SAMPLING		Sampling Bag	Sampling Bag		
SIZE / WEIGHT OF SAMPLE		± 70 Kg	± 70 Kg		
MOISTURE CONDITION OF		Slightly Moist	Slightly Moist		
HOLE No. / Km. / CHAINAGE		Test pit 10A	Test pit 10B		
COORDINATES					
LAYER TESTED / SAMPLED FROM		800 - 2200mm	2200 - 3000mm		
DATE RECEIVED		12 /03 /2013	12 /03 /2013		
MATERIAL DESCRIPTION		Moist dark greyish brown medium dense silty sand .	Wet olive brown medium dense shattered silty sand (residual).		
SIEVE ANALYSIS(mm) **(TMH A1a)**	75.0				
	63.0				
	53.0				
	37.5				
	26.5				
	19.0	100			
	13.2	95	100		
	4,75	84	91		
	2,00	71	82		
	0,425	62	72		
	0,075	31	39		
	0,002	21 / *19	20 / *20		
ATTERBERG LIMITS **(TMH A2&A3)**	LL%	36	31		
	P.I.	10	9		
	LS%	3.8	3.4		
GM - GRADING MODULES		1.36	1.07		
MOD AASHTO **(TMH A7)**	MDD kg/m^3	1820	1824		
	OMC%	15.5	11.2		
Moulded density	MD1	99.8	99.9		
	MD2	94.6	95.0		
	MD3	90.0	89.8		
Swell %	S1	2.4	2.2		
	S2	4.1	3.9		
	S3	6.2	5.4		
C.B.R.	100	25	18		
(TMH A8)	98	20	15		
	97	18	13		
	95	15	10		
	93	12	8		
	90	9	6		
CLASSIFICATION	HRB				
	TRH 14				
	COLTO	Fill	Fill		

Kind Regards

Wessel Badenhorst
FOR ROADLAB / PREHAB JV

Remarks :

* 0.02mm Fraction calculated based on a paper by Savage (2007)
The samples were subjected to analysis according to TMH 1:1986 Methods A1(a), A2, A3, A5, A7, A8 and ASTM D422.
The results reported relate only to the sample tested

Annexure C:
Particle size distribution

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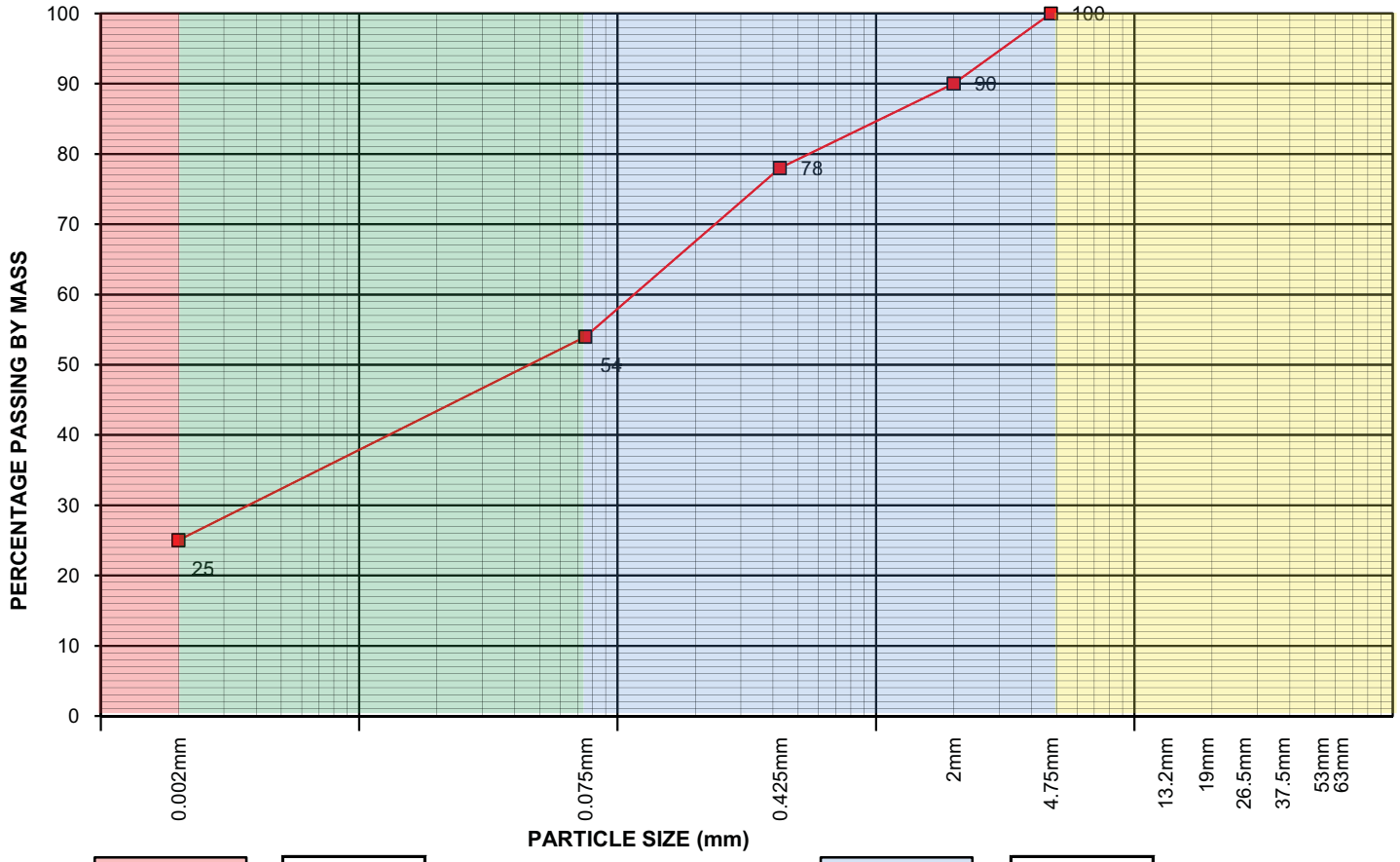
TEST PIT:	1	LAYER:	0 - 300	SAMPLE NR:	1A	DATE:	08/07/2013

PARTICLE SIZE ANALYSIS



CLAY	25%	SAND	46%
SILT	29%	GRAVEL	0%

Kind Regards

Wessel Badenhorst
FOR ROADLAB / PREHAB JV

Remarks :

The results reported relate only to the sample tested

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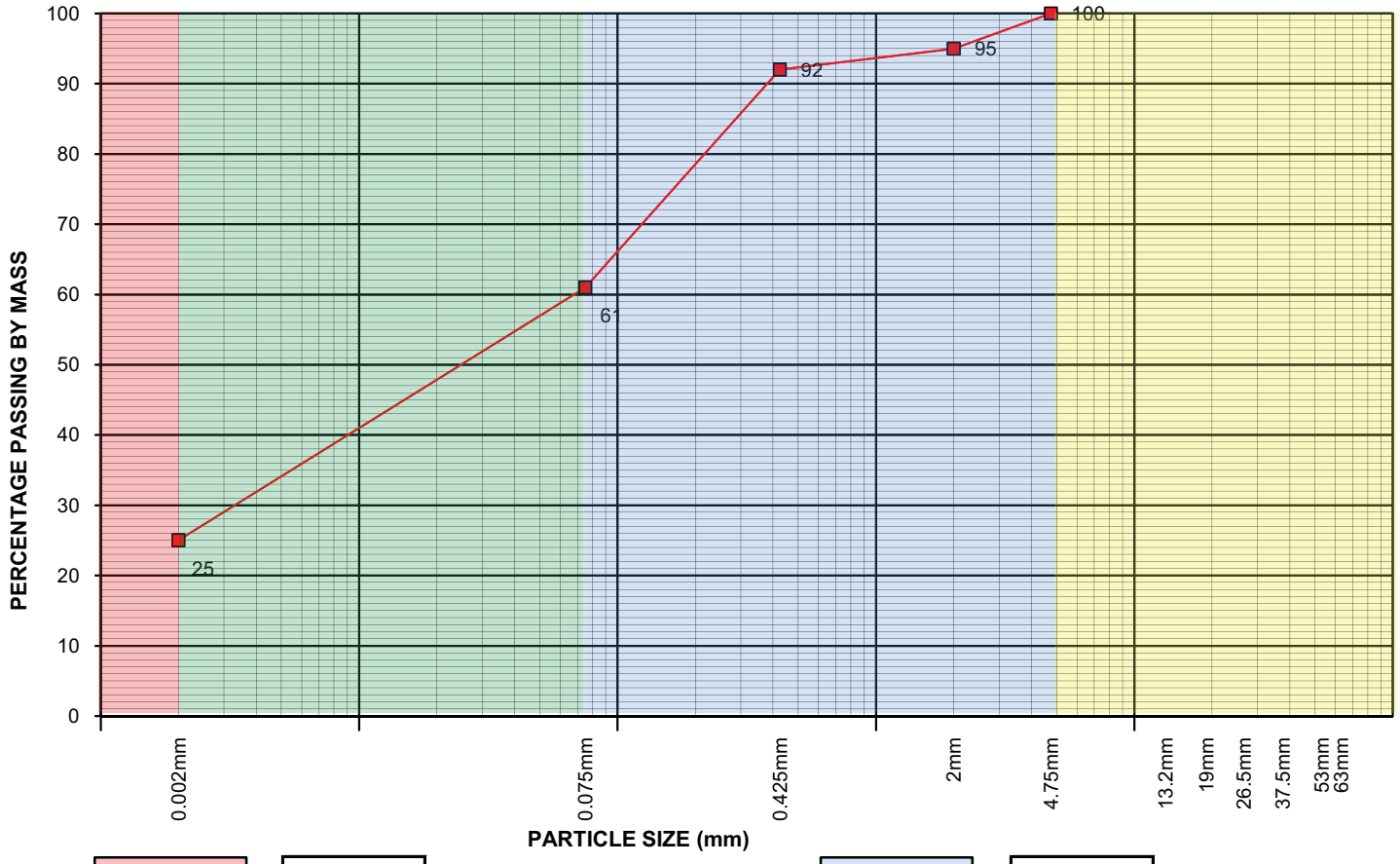
TEST PIT:	1	LAYER:	300 - 1600	SAMPLE NR:	1B	DATE:	08/07/2013

PARTICLE SIZE ANALYSIS



CLAY	25%	SAND	39%
SILT	36%	GRAVEL	0%

Kind Regards

Wessel Badenhorst
FOR ROADLAB / PREHAB JV

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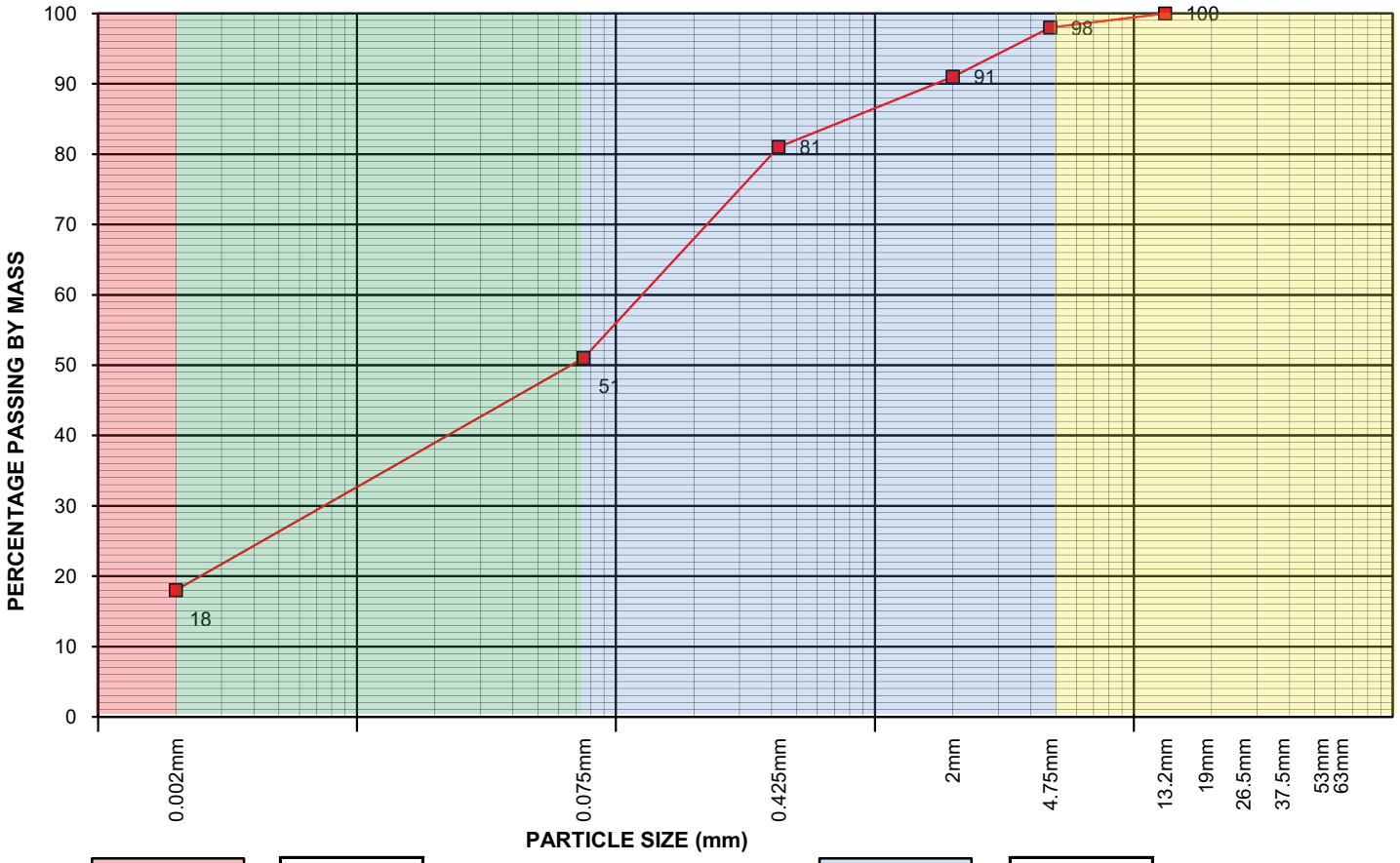
TEST PIT:	1	LAYER:	1600 - 2100	SAMPLE NR:	1C	DATE:	08/07/2013

PARTICLE SIZE ANALYSIS



CLAY	18%	SAND	47%
SILT	33%	GRAVEL	2%

Kind Regards

Wessel Badenhorst
FOR ROADLAB / PREHAB JV

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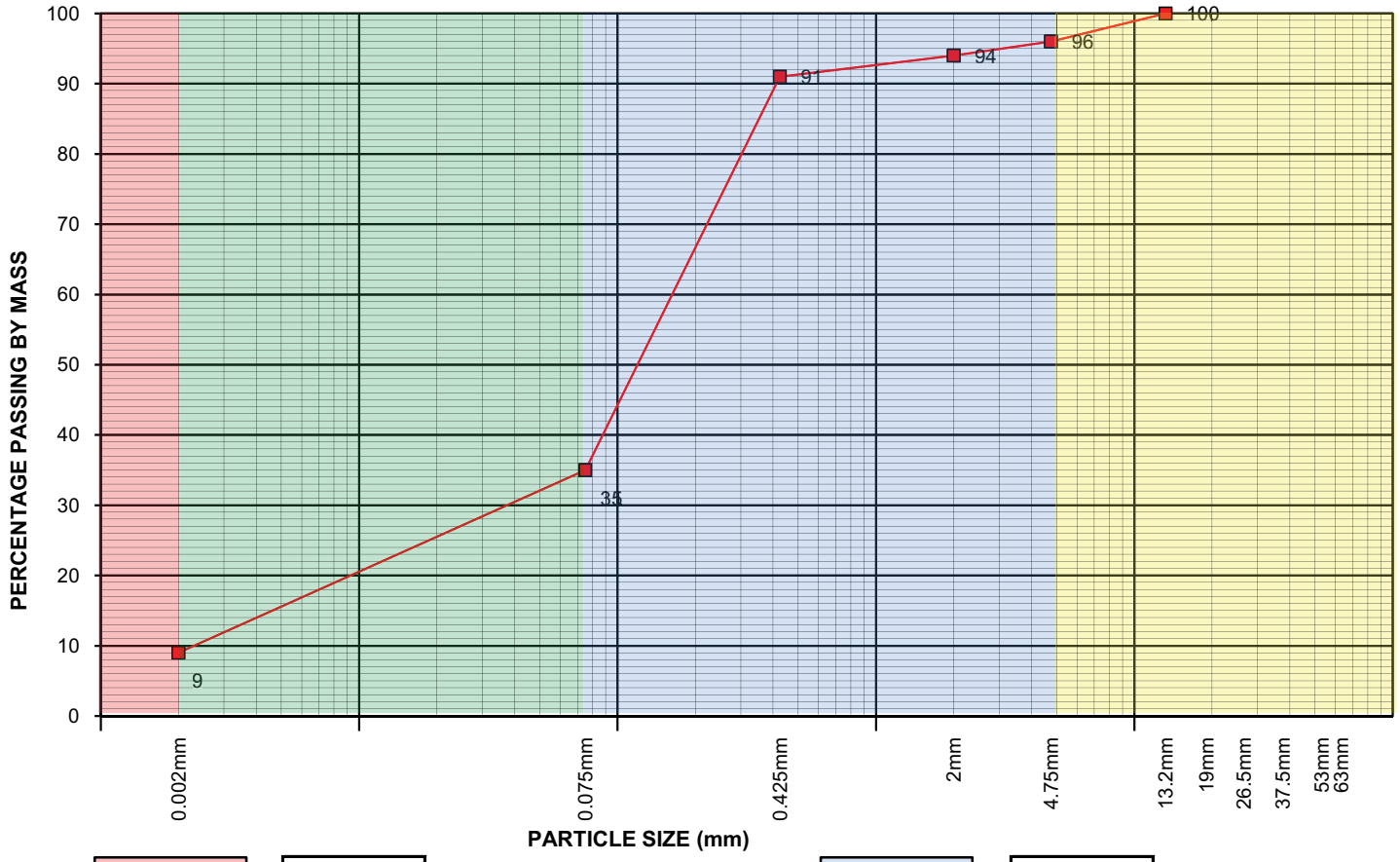
TEST PIT:	2	LAYER:	400 - 2000	SAMPLE NR:	2A	DATE:	08/07/2013

PARTICLE SIZE ANALYSIS



CLAY	9%	SAND	61%
SILT	26%	GRAVEL	4%

Kind Regards

Wessel Badenhorst
FOR ROADLAB / PREHAB JV

Remarks :

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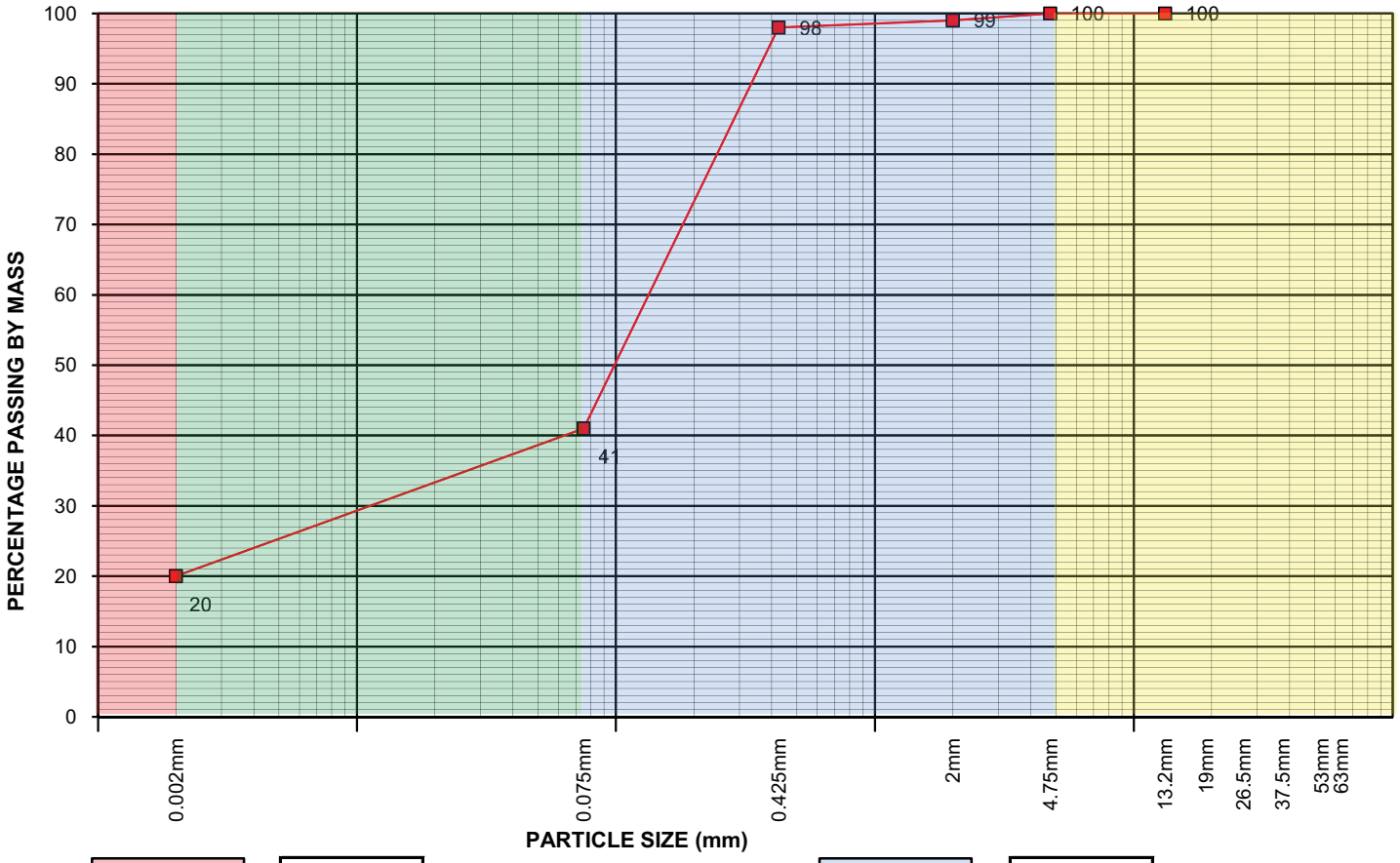
TEST PIT:	2	LAYER:	2000 - 2500	SAMPLE NR:	2B	DATE:	08/07/2013

PARTICLE SIZE ANALYSIS



CLAY	20%	SAND	59%
SILT	21%	GRAVEL	0%

Kind Regards

Wessel Badenhorst
FOR ROADLAB / PREHAB JV

Remarks :

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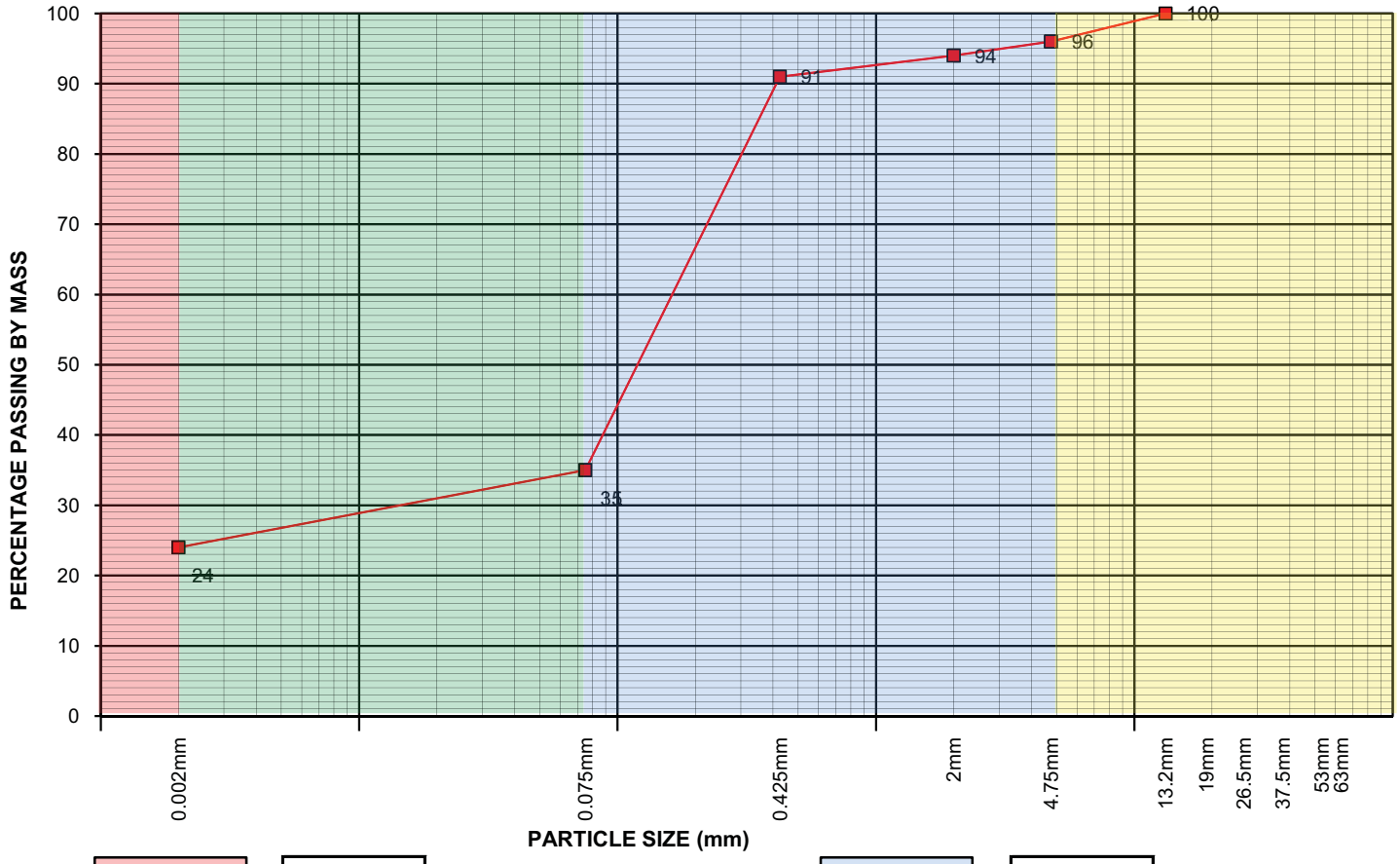
TEST PIT:	3	LAYER:	1000 - 2000	SAMPLE NR:	3A	DATE:	08/07/2013

PARTICLE SIZE ANALYSIS



CLAY	24%	SAND	61%
SILT	11%	GRAVEL	4%

Kind Regards

Wessel Badenhorst
FOR ROADLAB / PREHAB JV

Remarks :

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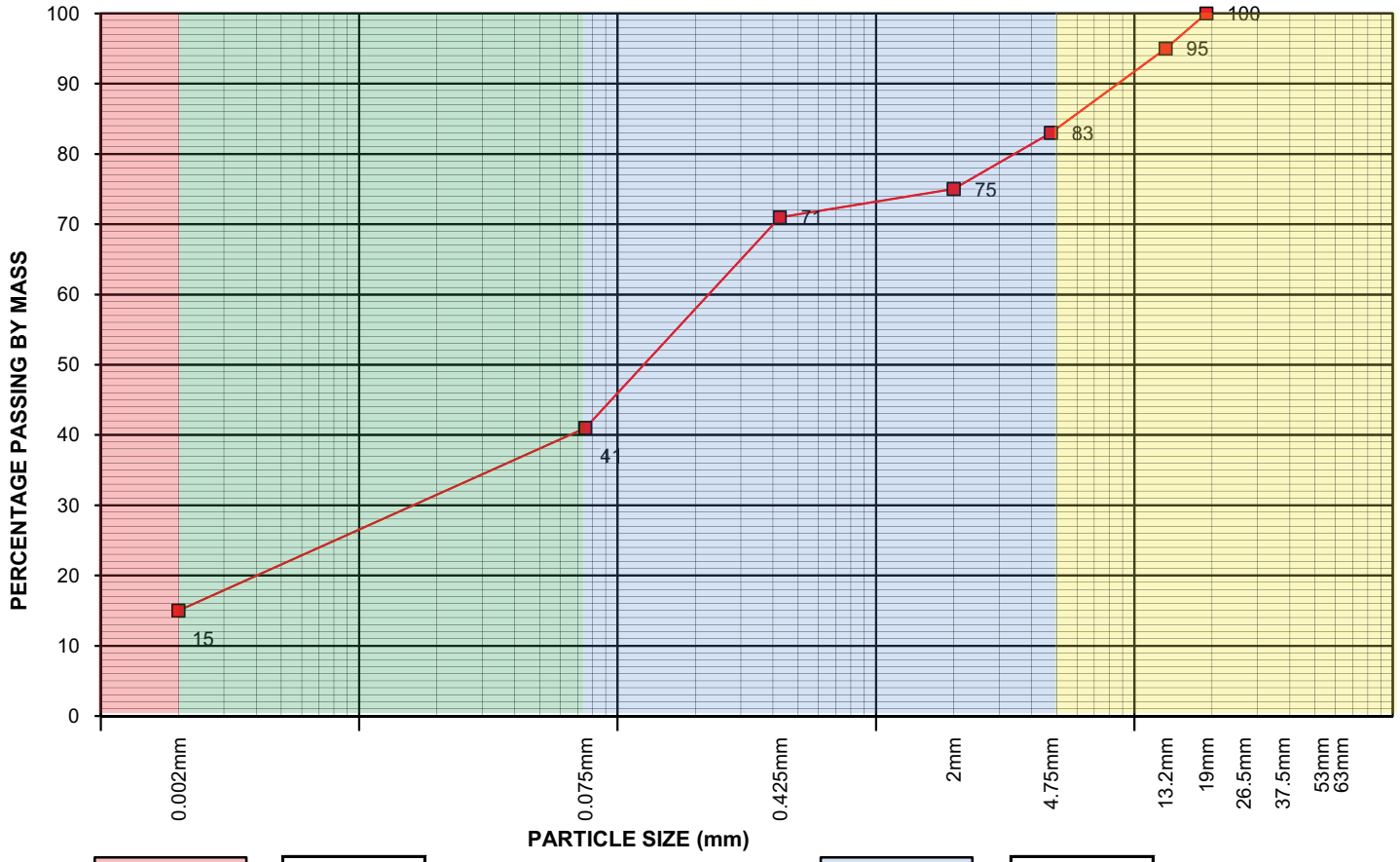
TEST PIT:	4	LAYER:	300 - 1200	SAMPLE NR:	4A	DATE:	08/07/2013

PARTICLE SIZE ANALYSIS



CLAY	15%	SAND	42%
SILT	26%	GRAVEL	17%

Kind Regards

Wessel Badenhorst
FOR ROADLAB / PREHAB JV

Remarks :

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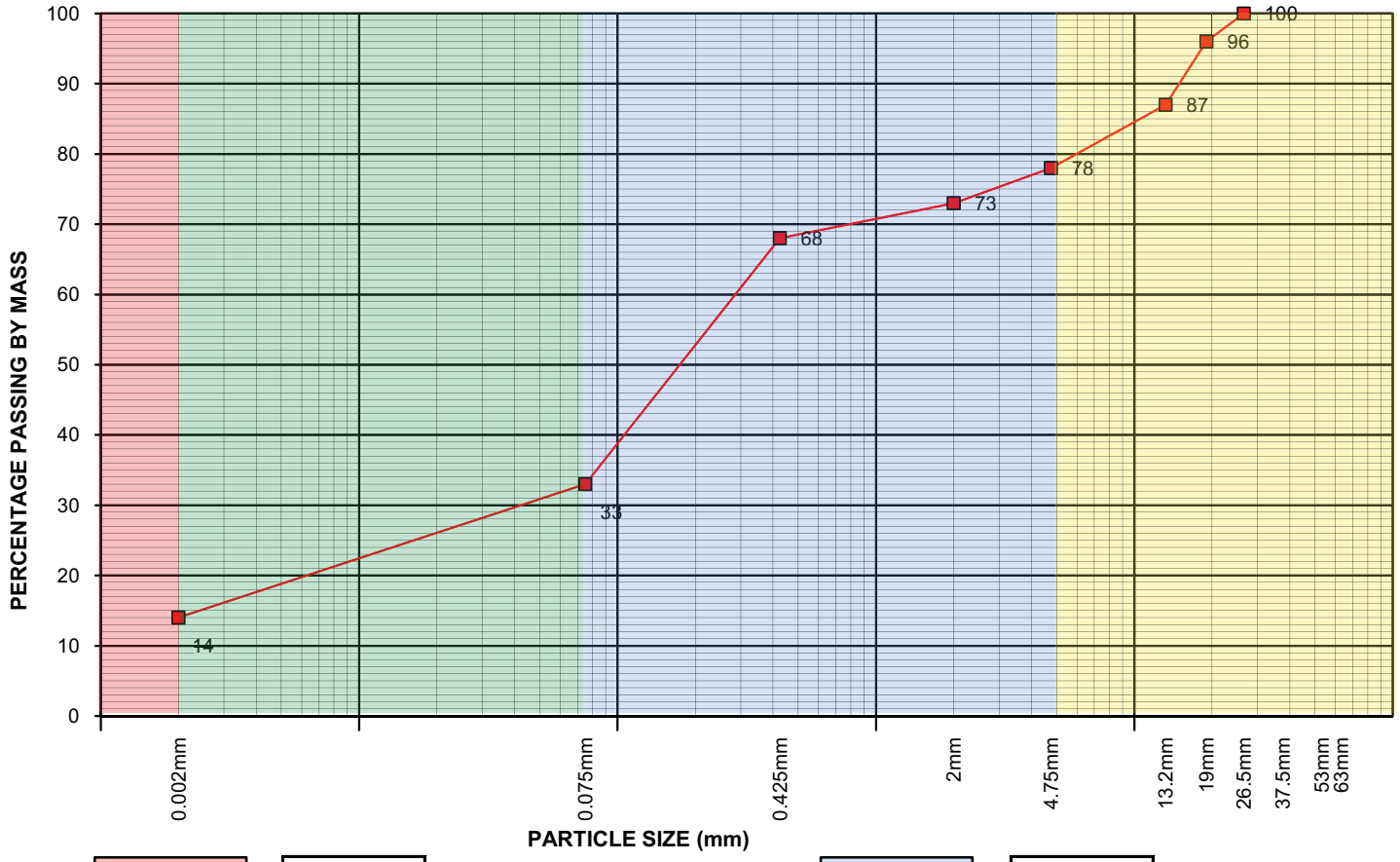
TEST PIT:	4	LAYER:	1200 - 2500	SAMPLE NR:	4B	DATE:	08/07/2013

PARTICLE SIZE ANALYSIS



CLAY	14%	SAND	45%
SILT	19%	GRAVEL	22%

Kind Regards

Wessel Badenhorst
FOR ROADLAB / PREHAB JV

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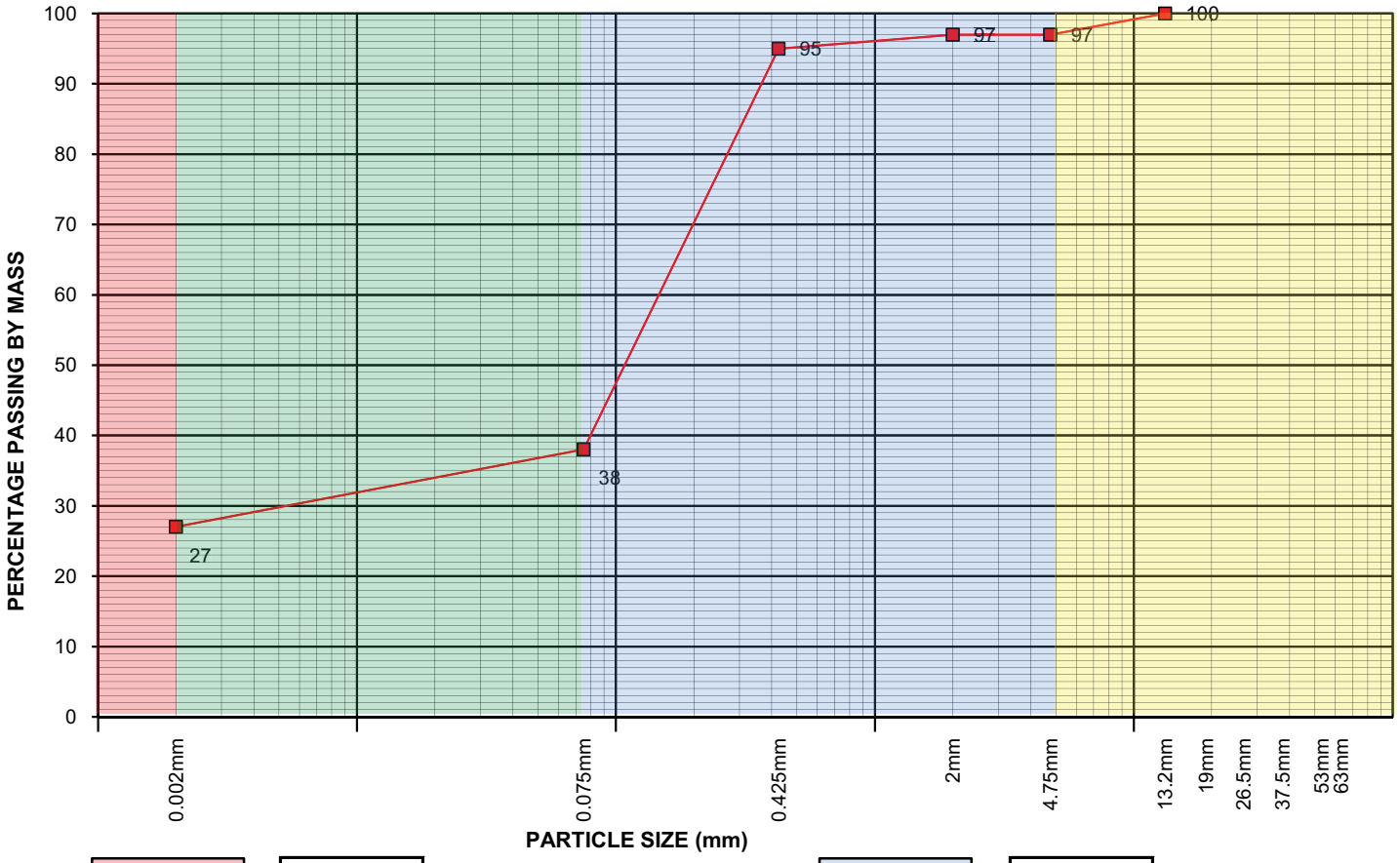
TEST PIT:	5	LAYER:	1100 - 2600	SAMPLE NR:	5A	DATE:	08/07/2013

PARTICLE SIZE ANALYSIS



CLAY	27%	SAND	59%
SILT	11%	GRAVEL	3%

Kind Regards

Wessel Badenhorst
FOR ROADLAB / PREHAB JV

Remarks :

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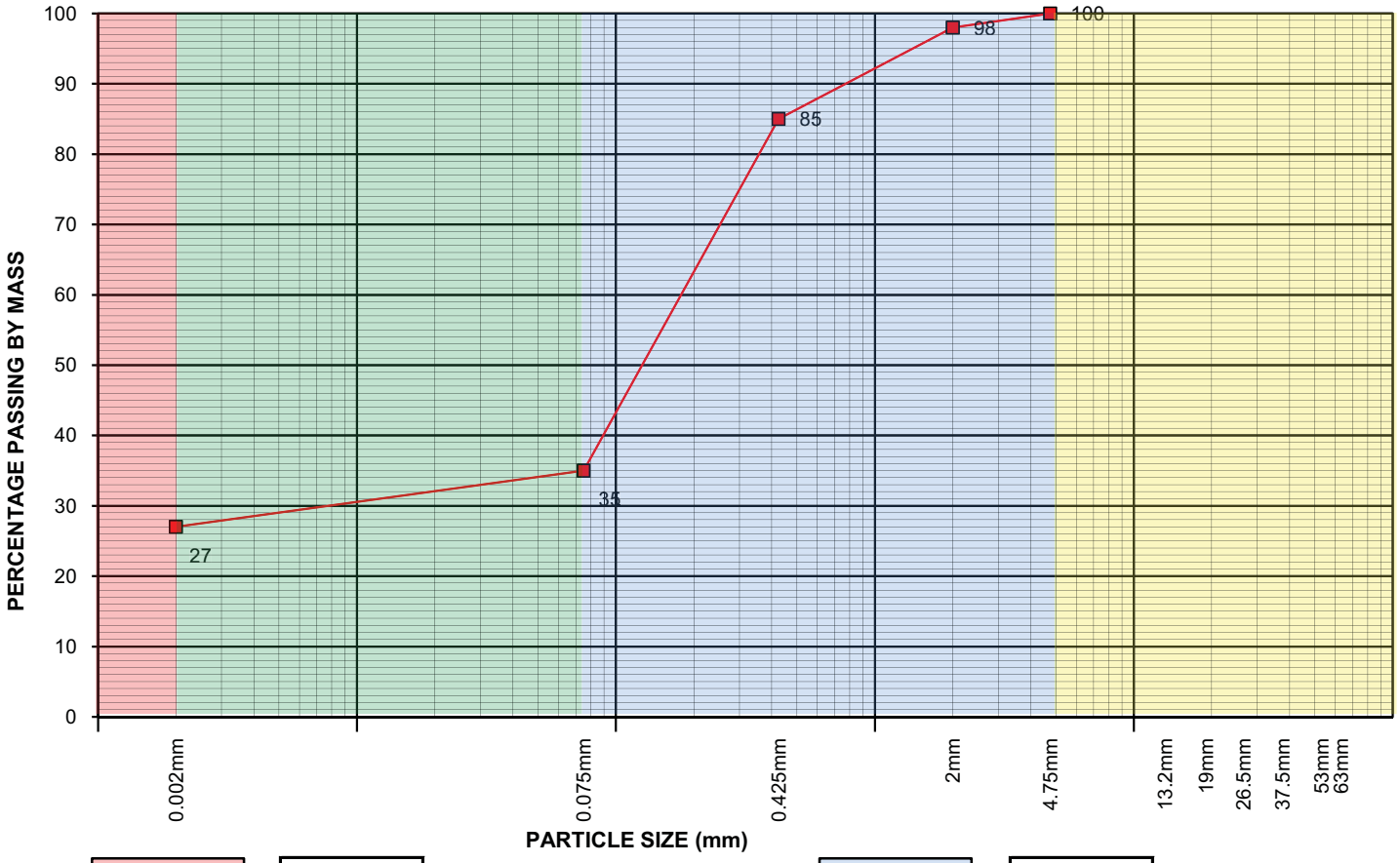
TEST PIT:	6	LAYER:	800 - 1700	SAMPLE NR:	6A	DATE:	08/07/2013

PARTICLE SIZE ANALYSIS



CLAY	27%	SAND	65%
SILT	8%	GRAVEL	0%

Kind Regards

Wessel Badenhorst
FOR ROADLAB / PREHAB JV

Remarks :

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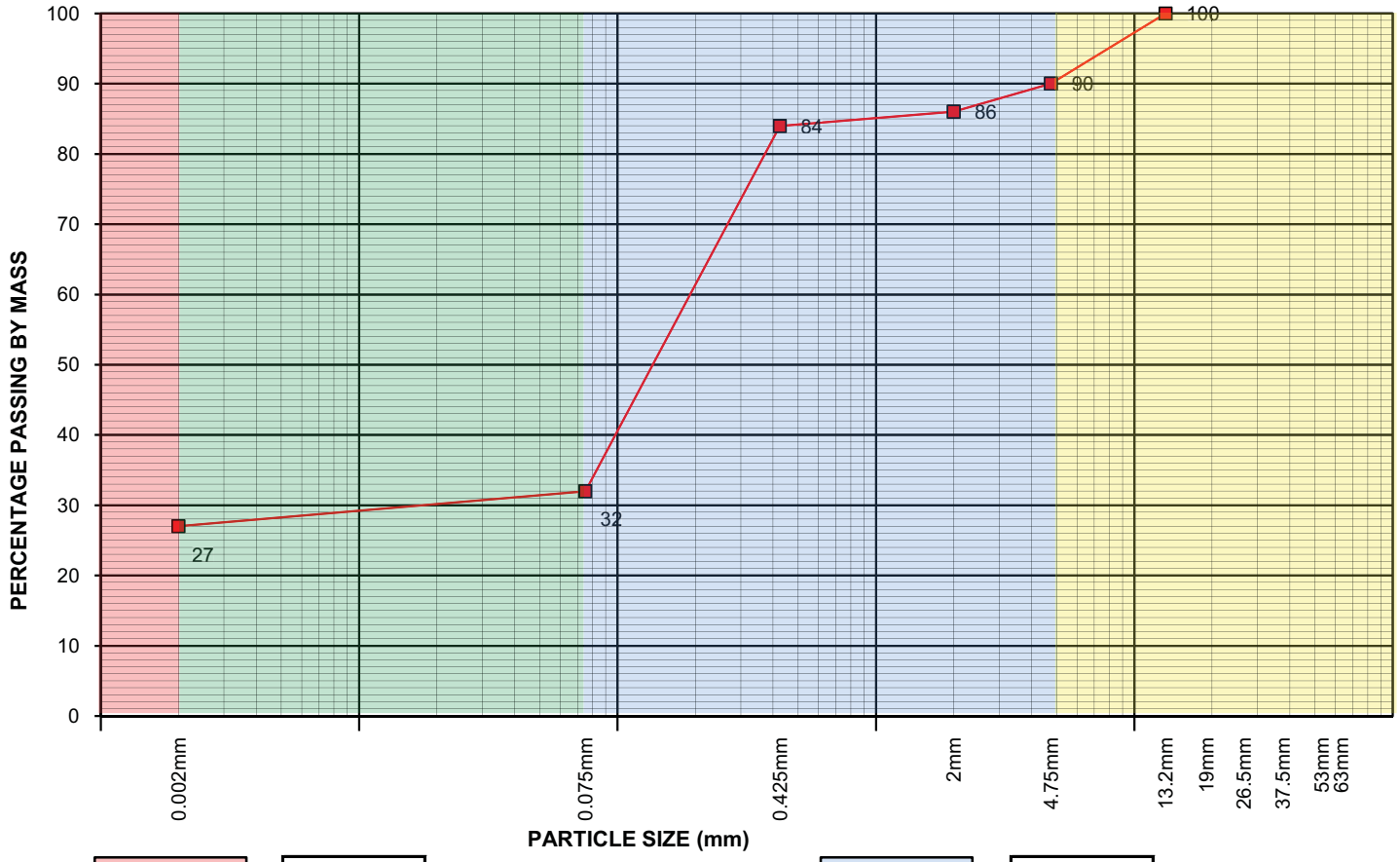
TEST PIT:	7	LAYER:	300 - 1600	SAMPLE NR:	7A	DATE:	08/07/2013

PARTICLE SIZE ANALYSIS



CLAY	27%	SAND	58%
SILT	5%	GRAVEL	10%

Kind Regards

Wessel Badenhorst
FOR ROADLAB / PREHAB JV

Remarks :

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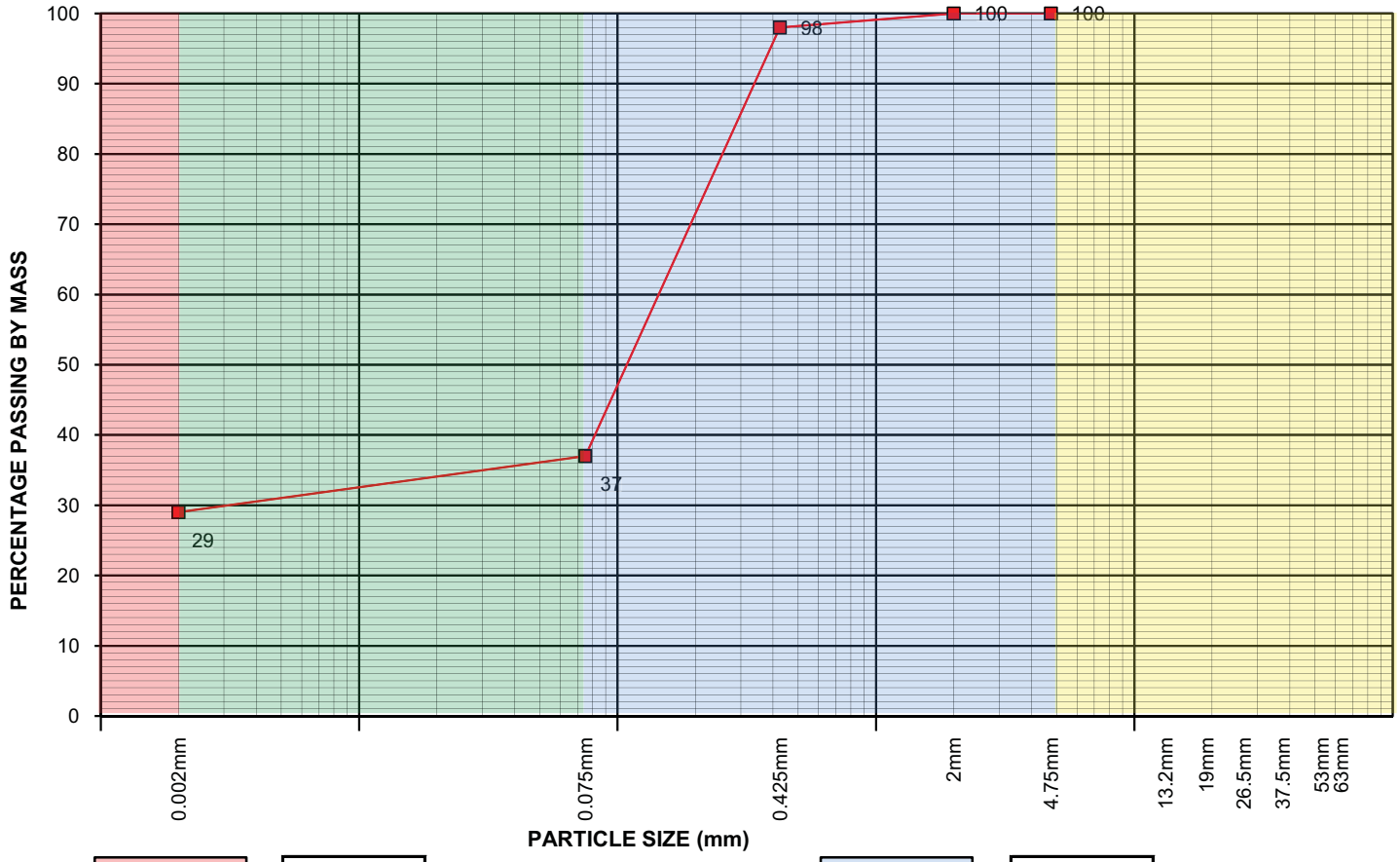
TEST PIT:	9	LAYER:	200 - 700	SAMPLE NR:	9A	DATE:	08/07/2013

PARTICLE SIZE ANALYSIS



CLAY	29%	SAND	63%
SILT	8%	GRAVEL	0%

Kind Regards

Wessel Badenhorst
FOR ROADLAB / PREHAB JV

Remarks :

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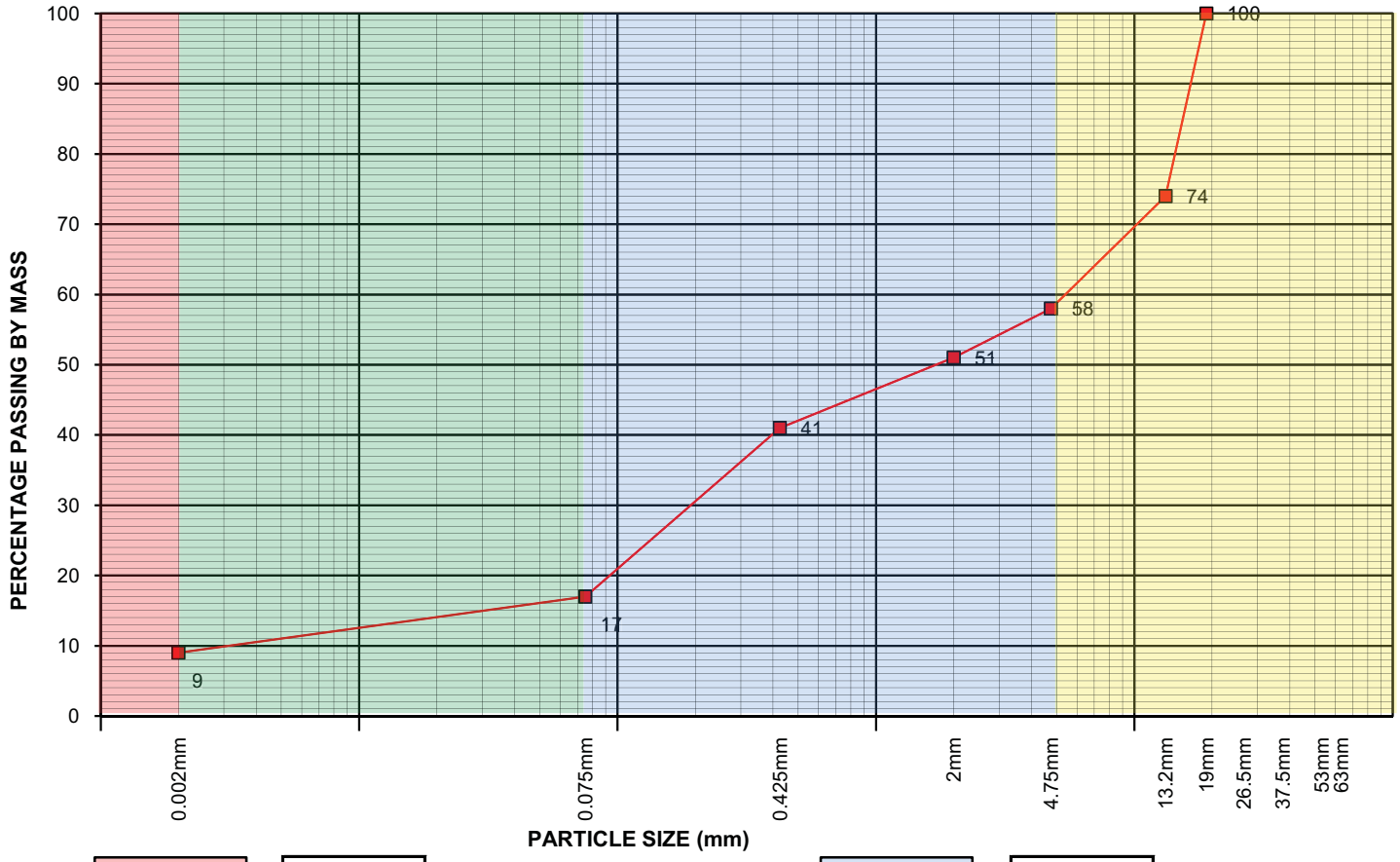
Civil Engineering Material Testing Laboratories

TEST PIT:	9	LAYER:	700 - 3000	SAMPLE NR:	9B	DATE:	08/07/2013

PARTICLE SIZE ANALYSIS



CLAY	9%	SAND	41%
SILT	8%	GRAVEL	42%

Kind Regards

Wessel Badenhorst
FOR ROADLAB / PREHAB JV

Remarks :

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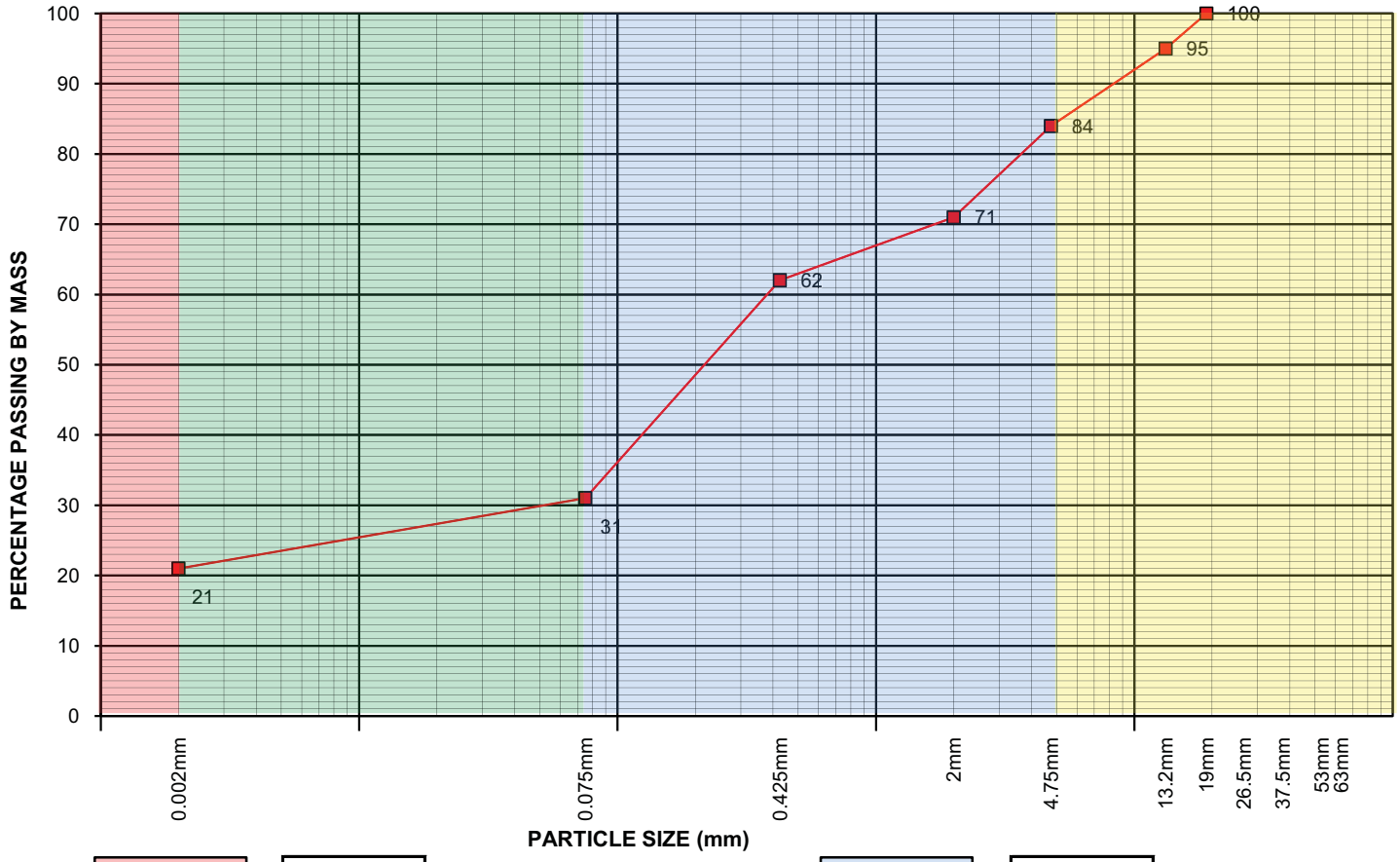
Civil Engineering Material Testing Laboratories

TEST PIT:	10	LAYER:	800 - 2200	SAMPLE NR:	10A	DATE:	08/07/2013

PARTICLE SIZE ANALYSIS



CLAY	21%	SAND	53%
SILT	10%	GRAVEL	16%

Kind Regards

Wessel Badenhorst
FOR ROADLAB / PREHAB JV

Remarks :

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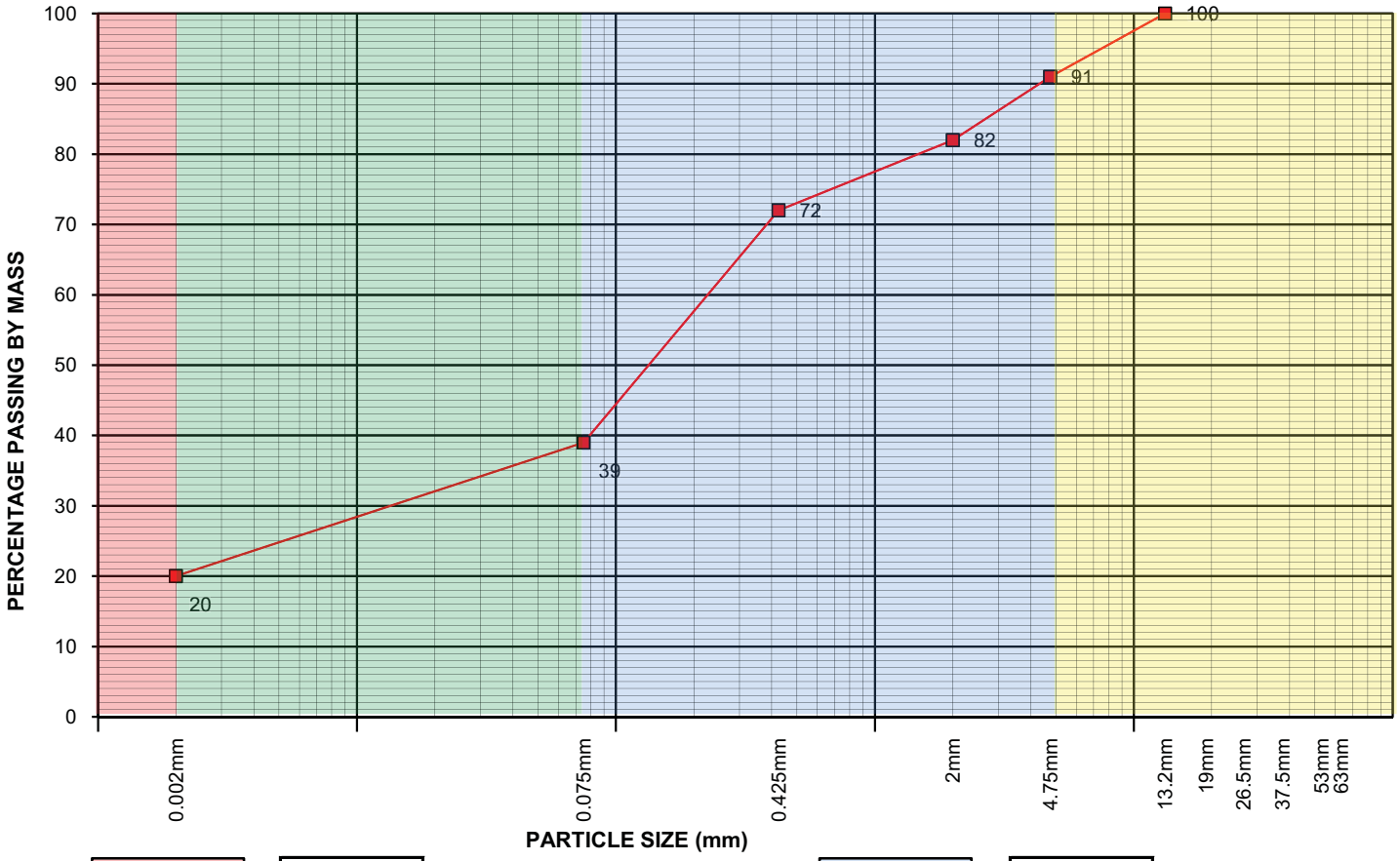
Civil Engineering Material Testing Laboratories

TEST PIT:	10	LAYER:	2200 - 3000	SAMPLE NR:	10B	DATE:	08/07/2013

PARTICLE SIZE ANALYSIS



CLAY	20%	SAND	52%
SILT	19%	GRAVEL	9%

Kind Regards

Wessel Badenhorst
FOR ROADLAB / PREHAB JV

Remarks :

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Annexure D:
Site Photos

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TYPICAL SITE PHOTOS

Annexure E:
Site Zoning


C1 / H
C1 / H
H2
P
P
Test Pit 1
Test Pit 2
Test Pit 3
Test Pit 4
Test Pit 5
Test Pit 6
Test Pit 7
Test Pit 8
Test Pit 9
Test Pit 10
Test Pit 11
Thabong Ext 12
Thabong Ext 15
Thabon
M4
Ndaki St
Ndaki Weg
Tsui Matsepe St
T E Senokoane St
F L Mate St
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© 2013 AfriGIS (Pty) Ltd.
Image © 2013 DigitalGlobe
Google earth
Imagery Date: 1/14/2013 27°57'11.63" S 26°49'23.90" E elev 1373 m eye alt 4.05 km