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PROJECT No: M16/3572 **12 August 2016**

DERICK PEACOCK ASSOCIATES
Resort and Leisure Planners
P.O. Box 39910
MORELETAPARK 0044

Attention: Mr. Derick Peacock

Dear Sir,

REPORT ON A GEOTECHNICAL INVESTIGATION CARRIED OUT FOR THE PROPOSED RESORT DEVELOPMENT ON: *PORTION 101 OF THE FARM TEN BOSCH 162-JU,* KOMATIPOORT DISTRICT, MPUMALANGA PROVINCE

1. INTRODUCTION

This report presents results and observations on a foundation investigation carried out during May 2016 for a proposed resort development that is to be situated on Portion 101 of the farm Ten Bosch 162-JU. The investigation was carried out at the request of Mr. Derick Peacock who is acting on behalf of his client, Mr. Piet van Dyk of Roosmaryn Boerdery, the registered owner of the property who proposes to develop a resort on the property. The development will comprise of 60 to 100 chalets and a central complex with recreational facilities. The investigation consisted of a detailed geotechnical investigation during which time a number of test pits were excavated across the site, combined with soil sampling and testing.

2. TERMS OF REFERENCE

The objectives of the desk study were to: -

- Determine the engineering properties of the site soils and bedrock including potentially expansive material, low bearing capacity soils and areas difficult to excavate.

- Present appropriate recommendations for residential township design and precautionary measures in accordance with the requirements of the National Home Builders Registration Council's guidelines.

The investigation was carried out in terms of written instructions received from Mr. Derick Peacock during April 2016.

3. INFORMATION CONSULTED

The following information was available and was consulted: -

- Reference was made to the 1: 50 000 Topographical Map 2531BD & 2532AC Komatipoort.

- The 1: 250 000 scale Geological Series Map Sheet Number 2530 Barberton.

- A site contour plan and flood line determination prepared to a scale of 1: 2 000 by WSM Leshika, Drawing Number WF16067-500-FLL-1-1 showing existing roads and structures, the boundaries of the proposed development and surface contours at 0,5m intervals.

- A colour aerial photograph of the property was obtained from Google Earth via the Internet.

- The publication "National Home Builders Registration Council's Home Building Manual, Part 1 & 2, February 1999.

4. SITE DESCRIPTION

The site for the proposed Ten Bosch Tourism development is located due east of Komatipoort, the property is of irregular shape and covers a surface area of some 41 hectares. The property is a fully operating agricultural venture presently used for the production of citrus and subtropical fruit, a number of residential and farm structures are located in the western and eastern portions of the site. The study area is located on the southern limb of a broad valley that is flanked by the Crocodile River and the Kruger National Park to the north. The area that was investigated has been partially cleared of large subtropical fruit trees.

A perennial drainage feature containing a large earth dam (some 2 hectares in extent) is located in the eastern portion of the site whilst a less prominent feature is situated in the central part of the property. The property is bounded to the south by a metalled service road between Hectorspruit and Komatipoort, to the north by the Crocodile River and on the reaming sides by adjacent farm portions. The undeveloped portions of the farm in and around the drainage features are covered by dense growths of indigenous trees and shrubs and the most common species observed were Acacia, Combretum, Diospyros, Dombeya, Ficus, Grewia, Harpephyllum, Maytenus, Pterocarpus, Rhus and Ziziphus *spp.*, to name a few. The ground surface drains via sheetwash and the aforementioned drainage featiure toward sthe north in the direction of the Crocdodile River at an average gradient ranging from less than 5% to about 15% along the drainage features.

5. SITE INVESTIGATION

Fifteen test pits were excavated across the site for the new development using a traxcavotor supplied by the client. The test pits were entered and inspected by the undersigned, a registered professional engineering geologist, who described the soil and bedrock formations in terms of the methods advocated by Jennings *et al* (1973) namely, moisture condition, colour, soil consistency, soil structure, soil type and origin (MCCSSO).

During the test pit profiling, disturbed an undisturbed representative soil and a water sample were recovered from the test pits and submitted to Roadlab's commercial soils laboratory in Johannesburg for testing and identification. Detailed descriptions of the test pit profiles are provided on the Soil Profile Sheets in Appendix 1 of the report whilst the laboratory test results appear in Appendix 2. The location of the test pits is shown on the "Geotechnical Map", Drawing Number M16/3572 at the back of the report.

6. OBSERVATIONS

The study area is underlain by transported sandy and gravelly soils overlying basalt bedrock belonging to the Letaba Formation, Lebombo Group, Karoo Supergroup.

Isolated outcrops of very hard rock basalt are present in the central, northern portion of the property which has been apportioned into three prominent geotechnical soil zones, Soil Zones "A" to "C" as shown on the "Geotechnical Map", Drawing Number M16/3572 in the pocket at the back of the report.

Soil Zone "A" materials cover the *major portion* of the site and a generalized and simplified description of the typical soil profile that may be encountered here is as follows: -

0,0 – 0,2: Slightly moist, dark brown, medium dense, intact, clayey SAND containing tree roots; colluvium. This horizon is absent in some test pits.

0,2 – 0,5: Abundant coarse, angular BASALT and QUARTZ GRAVELS, clast supported in a matrix of dry, dark brown, clayey SAND; pebble marker. Overall consistency is loose. Underlain by dark olive, very dense, coarse SAND from residual basalt in places.

0,5 – 1,7: Pale green stained orange on joints, highly weathered, closely jointed, soft rock, BASALT. Small, rounded hard rock corestones (small boulders) present. Bedrock becomes very hard rock from below 0,9m in some places.

Soil Zone "B" materials occupy the *central portion* of the site and a generalized and simplified description of the typical soil profile that may be encountered here is as follows: -

0,0 – 0,6: Slightly moist, dark brown, very stiff, shattered, sandy CLAY and reddisah brown, loose, voided, silty SAND containing tree roots; colluvium/alluvium. This horizon extends down to depths ranging from 0,7m to 1,5m below surface.

0,6 – 1,0: Abundant coarse, angular BASALT and QUARTZ GRAVELS, clast supported in a matrix as above; pebble marker. Overall consistency is loose. Extends to 1,5m in places. Underlain by dark olive, dense, coarse SAND from residual basalt in places.

1,0 – 1,7: Pale green stained orange on joints, highly weathered, closely jointed, soft rock, BASALT.

Soil Zone "C" occupies the two low-lying areas and drainage features containing the earth dam where the 1: 100 year flood line has been determined and shown on the map.

Slow excavation to abrupt refusal of the traxcavator was experienced from below 0,9m to 1,8m below surface in hard rock to very hard rock basalt. Minor to moderate seepage of ground water was encountered in two test pits located in the eastern portion of the site adjacent to the earth dam at depths ranging from 1,5m to 1,8m below surface, the remainder of the pits were dry during the investigation which was carried out during the middle of the dry season.

7. GEOTECHNICAL CONSIDERATIONS

7.1 Expansive Soils

The site soils blanketing portions of Soil Zone "B" are generally clayey and are potentially "medium" in the degree of expansiveness, based on the results of the laboratory tests and according to the Van der Merwe (1964) method. A total surface heave value of possibly up to 15mm is predicted here, should the moisture condition of the soils change from a desiccated to saturated condition. Soil Zone "A" is occupied by soils that are potentially "low" in the degree of expansiveness and where total surface heave values of less than 7,5mm is predicted.

7.2 Compressible and Collapsible Soils

The upper sandy and gravelly horizons that extend down to some 0,3m to 0,8m below surface across Soil Zone "A" and down to a maximum of 1,5m below surface across Soil Zone "B", are considered to be potentially compressible, based on a visual appraisal of the soil structure i.e. a loose consistency and a voided texture. These soils were unfortunately too friable in order to take undisturbed soil samples.

7.3 Excavation Characteristics

No problems should be experienced in excavating the site soils down to a depth of at least 1,7m below surface using conventional earth-moving machines. Isolated areas of very hard excavation and limited blasting will be encountered in hard rock basalt bedrock and in basalt boulders in portions of the site from below 0,9m and possibly at shallower depths. It is not improbable that large corestones (boulders) of hard rock may be present within the residual soils and where encountered, these will require jackhammer work and possibly blasting for removal. Saturated soil conditions and subsequent collapse of the sidewalls of excavations can be expected in the eastern portion of Soil Zone "A" and trenches may have to be shored in this area in order to prevent collapse in these areas.

7.4 Foundations

Soil Zone "A"

The major portion of the proposed development classifies as a NHBRC Site Class "C1/S1/H" according to the guidelines of the NHBRC Standards and Guidelines of 1999 and in view of the moderate horizon of potentially collapsible and compressible soils which blanket this soil zone (excluding areas that may be affected by a flood line), one of the following foundation systems may be considered for single-storey, rigid, residential masonry structures: -

Deep Strip Foundations

- Normal construction with drainage precautions and with mesh reinforced floor slabs.
- Founding on the dense to very dense residual basalt or basalt bedrock at depths ranging from 0,3m to 0,8m below surface and adopting a safe allowable bearing pressure ranging from 300 kPa to 1MPa, depending on the quality of the material exposed in the foundation trench.

Compaction of in situ soils below individual footings

- Remove in situ material below foundations to a depth and width of 1,5 times the foundation width or to a competent horizon and replace with material compacted to 93% Mod AASHTO density at -1% to +2% of optimum moisture content.
- Normal construction with lightly reinforced strip footings.
- Light reinforcement in masonry.
- Site drainage and plumbing/service precautions to be taken.

Soil Raft

- Remove in situ material to 1m beyond perimeter of building to a depth of 1,5 times the widest foundation or to a competent horizon and replace with material compacted to 93% Mod AASHTO density at -1% to +2% of optimum moisture content.
- Normal construction with lightly reinforced strip footings.
- Light reinforcement in masonry.
- Site drainage and plumbing/service precautions to be taken.

Modified Normal Construction

- Reinforced strip footings
- Articulation joints at some internal and all external doors
- Light reinforcement in masonry
- Site drainage and plumbing precautions to be taken
- Foundation pressure not to exceed 50 kPa.

Soil Zone "B"

The central portion of the proposed development classifies as a NHBRC Site Class "C1/S1/H1" according to the guidelines of the NHBRC Standards and Guidelines of 1999 and in view of the moderate horizon of potentially collapsible, compressible and moderately expansive soils which blanket this soil zone (excluding areas that may be affected by a flood line), one of the following foundation systems may be considered for single-storey, rigid, residential masonry structures: -

Deep Strip Foundations

- Normal construction with drainage precautions and with mesh reinforced floor slabs.
- Founding on the dense to very dense residual basalt or basalt bedrock at depths ranging from 0,7m to 1,5m below surface and adopting a safe allowable bearing pressure ranging from 300 kPa to 1MPa, depending on the quality of the material exposed in the foundation trench.

Soil Raft

- Remove all or part of the expansive horizon to 1m beyond the perimeter of the structure and replace with inert backfill compacted to 93% Mod AASHTO density at -1% to +2% of optimum moisture content.
- Normal construction with lightly reinforced strip footings and light reinforcement in masonry if residual movements are <7,5mm or construction type appropriate to residual movement.
- Site drainage and plumbing/service precautions to be taken.

Soil Zone "C"

This soil zone tentatively classifies as a Site Class "P" according to the National Home Builders Registration Council's (NHBRC) Standards and Guidelines of 1999 and in view of the fact that this zone is affected by seasonal flooding, it is recommended that stands that may be influenced by this soil zone, be excluded from the development.

The design and construction of raft foundations (whether soil or concrete) should be carried out in accordance with and under supervision of a civil or structural engineer and the NHBRC a competent person should verify classification given here. The design of multi-storey structures should take cognizance of the potentially problematic conditions that prevail across the site. These structures may safely be founded onto the dense to very dense residual basalt or basalt bedrock that is present below the problematic horizons where a safe allowable bearing pressure of 300 kPa to about 1 MPa respectively, is applicable.

Areas of disturbed ground conditions (areas of fill, test pits, open furrows etc.) may be encountered during construction and where present, these should be carefully reinstated. The removal of the large citrus and subtropical trees across the site has resulted in large-scale surface disturbance of the in situ soils. These areas should be carefully reinstated and all tree roots and organic matter be removed prior to the construction of dwelling units.

7.5 Earthworks

The upper site soils were tested to determine their compaction characteristics. A summary of the test results appears below in Table 7.1: -

TABLE 7.1: SUMMARY OF COMPACTION TESTS

HOLE NO	DEPTH (m)	SOIL TYPE	PI	GM	CBR	TRH 14	SWELL (%)
TB/2	0,3 – 1,3	Sandy GRAVELS	13	2,54	25	G5	0,08

Note : PI = Plasticity Index
GM = Grading Modulus
CBR = California Bearing Ration at 95% Mod AASHTO compaction

Based on the results of the compaction tests, it is evident that the sandy and gravelly soils blanketing Soil Zone "A" should be suitable for use as fill underneath surface beds and for use as selected layers and subbase layers in road construction (G5 Quality), after carefully removing all organic material. The clayey soils blanketing portions of Soil Zone "B" are considered to be unsuitable for use as a construction material.

7.6 Ground Water and Soil Chemistry

Minor to moderate seepage of ground water was encountered in two test in the eastern portion of the site from below a depth of 1,5m in the lower-lying areas adjacent to the earth dam. No water seepage were encountered elsewhere, however, the necessary damp-proofing precautions should therefore be taken underneath structures. The site soils are expected to be potentially chemically aggressive with regards to underground ferrous metal pipes (pH values ranging from 6,83 to 7,43 and electrical conductivity values ranging from 4,83 to 152,9 mS/m) and the use of non-ferrous metal pipes or plastic pipes are recommended for wet services. The chemical tests conducted on the ground water sample have shown the water to be of good quality for human consumption although the water is corrosive towards metals and concrete.

8. GENERAL

While every effort has been made to ensure that representative test pitting and sampling has been undertaken to probe the soils on-site, guaranteeing that isolated zones of either poor foundation material or hard rock excavation have not been identified, is impossible under the constraints of an investigation of this nature. The investigation has sought to highlight general areas of potential foundation and excavation problems, and to provide early warning to the design engineers and town planners. In view of the variability inherent in soils, a competent person must inspect all foundation excavations. The placement of the engineered fills must be controlled with suitable field tests to ensure that the required densities are achieved during compaction, and that the quality of fill material is within specification.

Yours faithfully,

JOHANN VAN DER MERWE (Pr. Sci. Nat.)
Engineering Geologist

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9. APPENDICES

Test Pit Profiles

Laboratory Test Results

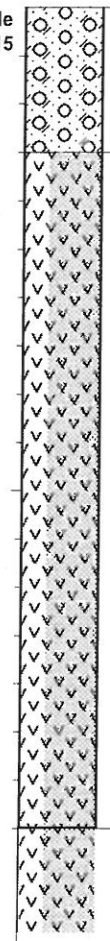
Geotechnical Map

DERICK PEACOCK ASSOCIATES
Portion 101 of Ten Bosch 162-JU, Mpumalanga Province
GEOTECHNICAL INVESTIGATION CARRIED OUT FOR:
PROPOSED RESIDENTIAL TOWNSHIP DEVELOPMENT

HOLE No: *TB/1*
Sheet 1 of 1

JOB NUMBER: *M16/3572*

Scale 1:15



0.00 — *Abundant coarse, angular BASALT GRAVELS, clast supported in a matrix of dry, dark brown, clayey SAND; pebble marker. Overall consistency is loose.*

0.30 — *Dark olive green stained orange on joints, moderately weathered, very closely jointed, soft rock BASALT.*

1.70 — *As above becoming hard rock.*

NOTES

1) *Gradual refusal of traxcavator at 1,7m in basalt bedrock.*

2) *No water seepage encountered.*

3) *Joints are open, vertically and sub-vertically inclined and north-south and east-west oriented.*

CONTRACTOR : *Local contractor*
MACHINE : *Traxcavator*
DRILLED BY :
PROFILED BY : *jvdm*

TYPE SET BY : jovdm
SETUP FILE : STANDARD.SET

INCLINATION : *Vertical*
DIAM : *Trench*
DATE : *May 2016*
DATE : *13/05/2016*

DATE : 08/08/2016 20:16
TEXT : ..lot\ARCHIVE\peac3572.txt

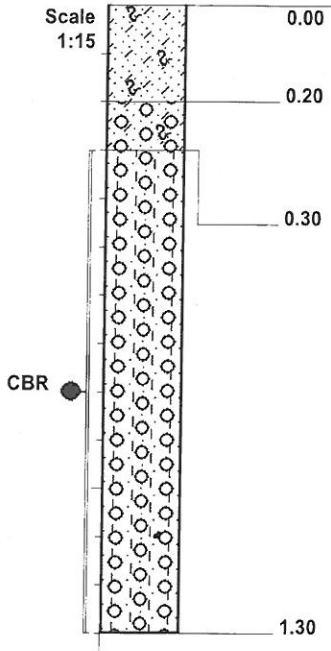
ELEVATION : *;*
X-COORD : *S25 23 13.9*
Y-COORD : *E31 52 59.7*

HOLE No: *TB/1*

DERICK PEACOCK ASSOCIATES
Portion 101 of Ten Bosch 162-JU, Mpumalanga Province
GEOTECHNICAL INVESTIGATION CARRIED OUT FOR:
PROPOSED RESIDENTIAL TOWNSHIP DEVELOPMENT

HOLE No: *TB/2*
Sheet 1 of 1

JOB NUMBER: *M16/3572*



0.00 – 0.20: *Slightly moist, dark brown, medium dense, intact, clayey SAND containing roots; colluvium.*

0.20 – 0.30: *Abundant coarse, angular BASALT GRAVELS, clast supported in a matrix as above; pebble marker.*
Overall consistency is loose.

0.30 – 1.30: *Dry, pale green staind orange on joints, medium dense with dense zones, relict jointed, silty sandy GRAVELS; residual basalt.*

NOTES

1) *No refusal of traxcavator at 1,3m.*
2) *No water seepage encountered.*
3) *Disturbed bulk CBR sample taken from 0,3m--1,3m.*

CONTRACTOR : *Local contractor*
MACHINE : *Traxcavator*
DRILLED BY :
PROFILED BY : *jvdm*

TYPE SET BY : jovdm
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : *Trench*
DATE : *May 2016*
DATE : *13/05/2016*

DATE : 08/08/2016 20:16
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ELEVATION :
X-COORD : *S25 23 07.4*
Y-COORD : *E31 52 58.1*

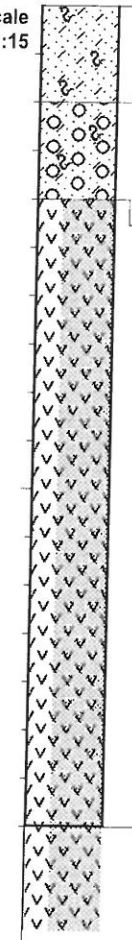
HOLE No: *TB/2*

DERICK PEACOCK ASSOCIATES
Portion 101 of Ten Bosch 162-JU, Mpumalanga Province
GEOTECHNICAL INVESTIGATION CARRIED OUT FOR:
PROPOSED RESIDENTIAL TOWNSHIP DEVELOPMENT

HOLE No: TB/3
Sheet 1 of 1

JOB NUMBER: M16/3572

Scale 1:15



0.00	*Slightly moist, dark brown, medium dense, intact, clayey SAND containing roots; colluvium.*
0.20	*Abundant coarse, angular BASALT GRAVELS, clast supported in a matrix as above; pebble marker. Overall consistency is loose.*
0.40	*Pale green stained orange on joints, highly weathered, closely jointed, soft rock BASALT.*
1.70	*As above becoming medium hard rock.*

NOTES

1) *Gradual refusal of traxcavator at 1,7m in basalt bedrock.*

2) *No water seepage encountered.*

CONTRACTOR : Local contractor
MACHINE : Traxcavator
DRILLED BY :
PROFILED BY : jvdm

TYPE SET BY : jovdm
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : Trench
DATE : May 2016
DATE : 13/05/2016

DATE : 08/08/2016 20:16
TEXT : ..lot\ARCHIVE\peac3572.txt

ELEVATION :
X-COORD : S25 23 11.1
Y-COORD : E31 53 02.5

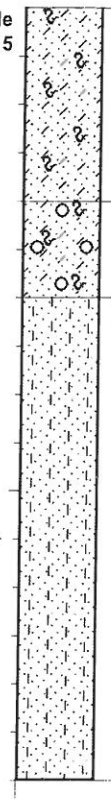
HOLE No: TB/3

DERICK PEACOCK ASSOCIATES
Portion 101 of Ten Bosch 162-JU, Mpumalanga Province
GEOTECHNICAL INVESTIGATION CARRIED OUT FOR:
PROPOSED RESIDENTIAL TOWNSHIP DEVELOPMENT

HOLE No: *TB/4*
Sheet 1 of 1

JOB NUMBER: *M16/3572*

Scale 1:15



0.00 — *Slightly moist, dark brown, medium dense, intact, clayey SAND containing roots; colluvium.*

0.40 — *As above and containing numerous well-rouned QUARTZ GRAVELS and PEBBLES; pebble marker.*
Overall consistency is loose.

0.60 — *Dry, dark olive speckled black, stained yellow and orange on joints, very dense, relict jointed, slightly silty coarse SAND; residual basalt.*

1.60

NOTES

1) *Gradual refusal of traxcavator at 1,6m in very dense residual basalt.*
2) *No water seepage encountered.*
3) *Disturbed indicator sample taken at 1,1m.*

CONTRACTOR : *Local contractor*
MACHINE : *Traxcavator*
DRILLED BY :
PROFILED BY : *jvdm*
TYPE SET BY : jovdm
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : *Trench*
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DATE : *13/05/2016*
DATE : 08/08/2016 20:16
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ELEVATION :
X-COORD : *S25 23 14.5*
Y-COORD : *E31 53 04.3*

HOLE No: *TB/4*

DERICK PEACOCK ASSOCIATES
Portion 101 of Ten Bosch 162-JU, Mpumalanga Province
GEOTECHNICAL INVESTIGATION CARRIED OUT FOR:
PROPOSED RESIDENTIAL TOWNSHIP DEVELOPMENT

HOLE No: *TB/5*
Sheet 1 of 1

JOB NUMBER: *M16/3572*

Scale 1:15

0.00 *Slightly moist, dark brown, medium dense, intact, clayey SAND containing abundant QUARTZ and QUARTZITE GRAVELS; pebble marker.*

0.30 *Dark olive green stained orange on joints, moderately weathered, very closely jointed, soft rock BASALT.*

1.70

NOTES

1) *Gradual refusal of traxcavator at 1,7m in basalt bedrock.*
2) *No water seepage encountered.*
3) *Disturbed indicator sample taken at 0,15m.*

CONTRACTOR : *Local contractor*
MACHINE : *Traxcavator*
DRILLED BY :
PROFILED BY : *jvdm*

TYPE SET BY : jovdm
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : *Trench*
DATE : *May 2016*
DATE : *13/05/2016*

DATE : 08/08/2016 20:16
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ELEVATION :
X-COORD : *S25 23 12.2*
Y-COORD : *E31 53 08.0*

HOLE No: *TB/5*

DERICK PEACOCK ASSOCIATES
Portion 101 of Ten Bosch 162-JU, Mpumalanga Province
GEOTECHNICAL INVESTIGATION CARRIED OUT FOR:
PROPOSED RESIDENTIAL TOWNSHIP DEVELOPMENT

HOLE No: *TB/6*
Sheet 1 of 1

JOB NUMBER: *M16/3572*

Scale 1:15

0.00 *Abundant coarse, angular BASALT GRAVELS, clast supported in a matrix of dry, light brown, clayey SAND; pebble marker.*
Overall consistency is loose and horizon undulates to 0,8m in places.

0.40 *Greyish green stained bluish black on joints, slightly weathered, medium to widely jointed, very hard rock BASALT.*

1.20

NOTES

1) *Abrupt refusal of traxcavator at 1,2m in basalt bedrock.*

2) *No water seepage encountered.*

3) *Material excavates as coarse gravel containing small boulders up to 0,6m in diameter.*

CONTRACTOR : *Local contractor*
MACHINE : *Traxcavator*
DRILLED BY :
PROFILED BY : *jvdm*

TYPE SET BY : jovdm
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : *Trench*
DATE : *May 2016*
DATE : *13/05/2016*

DATE : 08/08/2016 20:16
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ELEVATION :
X-COORD : *S25 23 08.6*
Y-COORD : *E31 53 10.4*

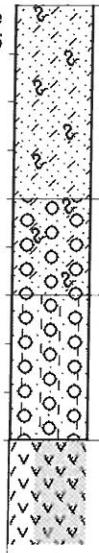
HOLE No: *TB/6*

DERICK PEACOCK ASSOCIATES
Portion 101 of Ten Bosch 162-JU, Mpumalanga Province
GEOTECHNICAL INVESTIGATION CARRIED OUT FOR:
PROPOSED RESIDENTIAL TOWNSHIP DEVELOPMENT

HOLE No: TB/7
Sheet 1 of 1

JOB NUMBER: M16/3572

Scale 1:15



0.00	*Slightly moist, dark brown, medium dense, intact, clayey SAND containing roots; colluvium.*
0.40	*Abundant coarse, angular BASALT GRAVELS, clast supported in a matrix as above; pebble marker. Overall consistency is loose.*
0.60	*Dry, pale green staind orange on joints, medium dense with dense zones, relict jointed, silty sandy GRAVELS; residual basalt.*
0.90	*Pale green stained orange on joints, slightly weathered, widely jointed, very hard rock BASALT.*

NOTES

1) *Abrupt refusal of traxcavator from 0,6m to 0,9m in basalt bedrock.*

2) *No water seepage encountered.*

CONTRACTOR : *Local contractor*
MACHINE : *Traxcavator*
DRILLED BY :
PROFILED BY : *jvdm*

TYPE SET BY : jovdm
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : *Trench*
DATE : *May 2016*
DATE : *13/05/2016*

DATE : 08/08/2016 20:16
TEXT : ..lot\ARCHIVE\peac3572.txt

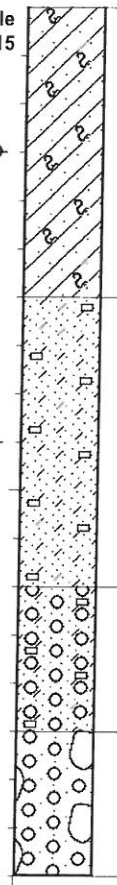
ELEVATION :
X-COORD : *S25 23 14.7*
Y-COORD : *E31 53 14.2*

HOLE No: TB/7

DERICK PEACOCK ASSOCIATES
Portion 101 of Ten Bosch 162-JU, Mpumalanga Province
GEOTECHNICAL INVESTIGATION CARRIED OUT FOR:
PROPOSED RESIDENTIAL TOWNSHIP DEVELOPMENT

HOLE No: *TB/8*
Sheet 1 of 1

JOB NUMBER: *M16/3572*



0.00	*Slightly moist, dark brown, very stiff, shattered, sandy CLAY containing fine gravels and tree roots; colluvium.*
0.60	*Dry, orange brown, medium dense, shattered, clayey SAND containing numerous fine GRAVELS and CALCRETE NODULES; alluvium.*
1.20	*Abundant coarse, angular and sub-angular QUARTZ and BASALT GRAVELS, clast supported in a matrix as above; pebble marker. Overall consistency is loose.*
1.50	*Dry, light olive, dense, sandy GRAVELS containing isolated small spheroids; residual basalt.*
1.80	

NOTES

1) *No refusal of traxcavator at 1,8m.*
2) *No water seepage encountered.*
3) *Disturbed indicator sample taken at 0,3m and at 0,9m.*

CONTRACTOR : *Local contractor*
MACHINE : *Traxcavator*
DRILLED BY :
PROFILED BY : *jvdm*

TYPE SET BY : jovdm
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : *Trench*
DATE : *May 2016*
DATE : *13/05/2016*

DATE : 08/08/2016 20:16
TEXT : ..lot\ARCHIVE\peac3572.txt

ELEVATION :
X-COORD : *S25 23 15.7*
Y-COORD : *E31 53 16.7*

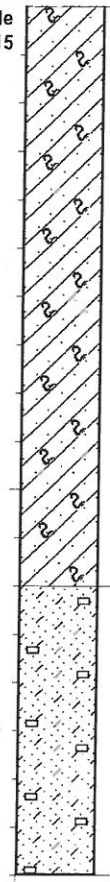
HOLE No: *TB/8*

DERICK PEACOCK ASSOCIATES
Portion 101 of Ten Bosch 162-JU, Mpumalanga Province
GEOTECHNICAL INVESTIGATION CARRIED OUT FOR:
PROPOSED RESIDENTIAL TOWNSHIP DEVELOPMENT

HOLE No: *TB/9*
Sheet 1 of 1

JOB NUMBER: *M16/3572*

Scale 1:15



0.00 *Slightly moist, dark brown, very stiff, shattered, sandy CLAY containing fine gravels and tree roots; colluvium.*

1.20 *Dry, orange brown, medium dense, shattered, clayey SAND containing numerous fine GRAVELS and CALCRETE NODULES; alluvium.*

1.80

NOTES

1) *No refusal of traxcavator at 1,8m.*
2) *No water seepage encountered.*
3) *Disturbed indicator sample taken at 1,5m.*

CONTRACTOR : *Local contractor*
MACHINE : *Traxcavator*
DRILLED BY :
PROFILED BY : *jvdm*
TYPE SET BY : jovdm
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : *Trench*
DATE : *May 2016*
DATE : *13/05/2016*
DATE : 08/08/2016 20:16
TEXT : ..lot\ARCHIVE\peac3572.txt

ELEVATION :
X-COORD : *S25 23 11.5*
Y-COORD : *E31 53 16.8*

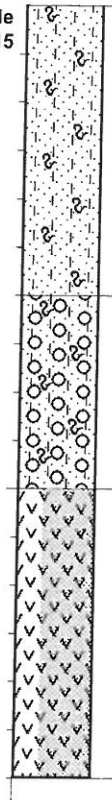
HOLE No: *TB/9*

DERICK PEACOCK ASSOCIATES
Portion 101 of Ten Bosch 162-JU, Mpumalanga Province
GEOTECHNICAL INVESTIGATION CARRIED OUT FOR:
PROPOSED RESIDENTIAL TOWNSHIP DEVELOPMENT

HOLE No: TB/10
Sheet 1 of 1

JOB NUMBER: M16/3572

Scale 1:15



0.00 *Dry, reddish brown, loose, slightly voided, silty SAND containing tree roots; alluvium.*

0.60 *Abundant coarse, angular BASALT and isolated QUARTZ GRAVELS, clast supported in a matrix as above; pebble marker. Overall consistency is loose.*

1.00 *Dark green speckled black, stained red on joints, moderately weathered, closely jointed, hard rock BASALT.*

1.60

NOTES

1) *Gradual refusal of traxcavator at 1,6m in basalt bedrock.*

2) *No water seepage encountered.*

3) *Material excavates as a coarse blocky gravel containing scattered small (0,2m in diameter) hard rock spheroids.*

CONTRACTOR : *Local contractor*
MACHINE : *Traxcavator*
DRILLED BY :
PROFILED BY : *jvdm*

TYPE SET BY : jovdm
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : *Trench*
DATE : *May 2016*
DATE : *13/05/2016*

DATE : 08/08/2016 20:16
TEXT : ..lot\ARCHIVE\peac3572.txt

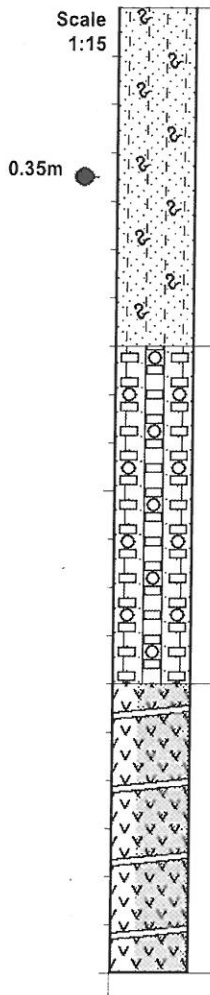
ELEVATION :
X-COORD : *S25 23 08.0*
Y-COORD : *E31 53 16.1*

HOLE No: TB/10

DERICK PEACOCK ASSOCIATES
Portion 101 of Ten Bosch 162-JU, Mpumalanga Province
GEOTECHNICAL INVESTIGATION CARRIED OUT FOR:
PROPOSED RESIDENTIAL TOWNSHIP DEVELOPMENT

HOLE No: *TB/11*
Sheet 1 of 1

JOB NUMBER: *M16/3572*



0.00 *Dry, reddish brown, loose, slightly voided, silty SAND containing tree roots; alluvium.*

0.70 *Abundant coarse, white NODUALR CALCRETE and scattered BASALT GRAVELS, clast supported in a matrix of dry, light khaki brown, sandy SILT; pebble marker.*
Overall consistency is dense.

1.40 *Dark olive stained black on joints, highly weathered, very closely jointed, soft rock BASALT.*
Contains bands of calcrete and coarse sand.

2.00

NOTES

1) *No refusal of traxcavator at 2,0m.*

2) *No water seepage encountered.*

3) *Material excavates as a coarse blocky gravel with fragments up to 60mm in diameter.*

4) *Disturbed indicator sample taken at 0,35m.*

CONTRACTOR : *Local contractor*
MACHINE : *Traxcavator*
DRILLED BY :
PROFILED BY : *jvdm*
TYPE SET BY : jovdm
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : *Trench*
DATE : *May 2016*
DATE : *13/05/2016*
DATE : 08/08/2016 20:16
TEXT : ..lot\ARCHIVE\peac3572.txt

ELEVATION :
X-COORD : *S25 23 06.8*
Y-COORD : *E31 53 20.5*

HOLE No: *TB/11*

DERICK PEACOCK ASSOCIATES
Portion 101 of Ten Bosch 162-JU, Mpumalanga Province
GEOTECHNICAL INVESTIGATION CARRIED OUT FOR:
PROPOSED RESIDENTIAL TOWNSHIP DEVELOPMENT

HOLE No: *TB/12*
Sheet 1 of 1

JOB NUMBER: *M16/3572*

Scale 1:15

0.00 *Dry, dark brown, medium dense, slightly voided, silty SAND containing tree roots; colluvium.*

0.30 *Abundant coarse, angular, dark yellow BASALT GRAVELS, clast supported in a matrix as above; pebble marker.*
Overall consistency is loose.

0.60 *Pale green stained bluish black and orange on joints, highly weathered, very closely jointed, soft rock BASALT.*
Contains isolated small, hard rock CORESTONES (small boulders).

1.80

NOTES

1) *Gradual refusal of traxcavator at 1,8m in basalt bedrock.*
2) *No water seepage encountered.*
3) *Disturbed indicator sample taken at 1,2m.*

CONTRACTOR : *Local contractor*
MACHINE : *Traxcavator*
DRILLED BY :
PROFILED BY : *jvdm*

TYPE SET BY : jovdm
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : *Trench*
DATE : *May 2016*
DATE : *13/05/2016*

DATE : 08/08/2016 20:16
TEXT : ..lot\ARCHIVE\peac3572.txt

ELEVATION :
X-COORD : *S25 23 13.6*
Y-COORD : *E31 53 26.6*

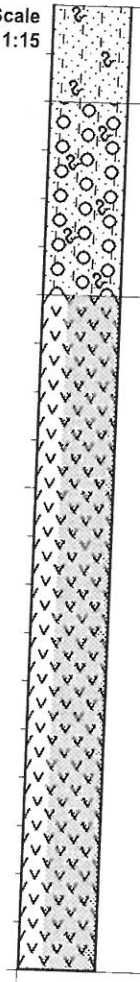
HOLE No: *TB/12*

DERICK PEACOCK ASSOCIATES
Portion 101 of Ten Bosch 162-JU, Mpumalanga Province
GEOTECHNICAL INVESTIGATION CARRIED OUT FOR:
PROPOSED RESIDENTIAL TOWNSHIP DEVELOPMENT

HOLE No: TB/13
Sheet 1 of 1

JOB NUMBER: M16/3572

Scale 1:15



0.00	Dry, dark brown, medium dense, slightly voided, silty SAND containing tree roots; colluvium.
0.20	Abundant coarse, angular, dark yellow, BASALT GRAVELS, clast supported in a matrix as above; pebble marker. Overall consistency is loose.
0.60	Greyish green stained orange on joints, moderately weathered, closely jointed, medium hard rock BASALT.
2.00	

NOTES

1) Gradual refusal of traxcavator at 2,0m in basalt bedrock.

2) No water seepage encountered.

3) Material excavates as a coarse blocky gravel with fragments up to 60mm in diameter.

CONTRACTOR : Local contractor
MACHINE : Traxcavator
DRILLED BY :
PROFILED BY : jvdm

TYPE SET BY : jovdm
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : Trench
DATE : May 2016
DATE : 13/05/2016

DATE : 08/08/2016 20:16
TEXT : ..lot\ARCHIVE\peac3572.txt

ELEVATION :
X-COORD : S25 23 16.9
Y-COORD : E31 53 25.8

HOLE No: TB/13

DERICK PEACOCK ASSOCIATES
Portion 101 of Ten Bosch 162-JU, Mpumalanga Province
GEOTECHNICAL INVESTIGATION CARRIED OUT FOR:
PROPOSED RESIDENTIAL TOWNSHIP DEVELOPMENT

HOLE No: *TB/14*
Sheet 1 of 1

JOB NUMBER: *M16/3572*

Scale 1:15

0.00	*Slightly moist, dark brown, very stiff, shattered, sandy CLAY containing rounded GRAVELS and COBBLES at the base and with tree roots; alluvium with basal pebble marker.*
0.40	*Abundant coarse, angular, dark yellow, BASALT GRAVELS, clast supported in a matrix of dark brown, clayey SAND; reworked residual basalt.* *Overall consistency is loose.*
0.60	*Dark olive stained orange on joints, highly weathered, very closely jointed, soft rock BASALT.* *Contains numerous medium-sized hard rock CORESTONES.*
1.70	

NOTES

1) *Gradual refusal of traxcavator at 1,7m in basalt bedrock.*

2) *Water table standing at 1,5m below surface.*

3) *Material excavates as a coarse blocky gravel with numerous small and medium-sized corestones up to 0,3m in diameter.*

4) *Water sample taken at 1,5m for chemical analysis.*

CONTRACTOR : *Local contractor*
MACHINE : *Traxcavator*
DRILLED BY :
PROFILED BY : *jvdm*

TYPE SET BY : jovdm
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : *Trench*
DATE : *May 2016*
DATE : *13/05/2016*

DATE : 08/08/2016 20:16
TEXT : ..lot\ARCHIVE\peac3572.txt

ELEVATION :
X-COORD : *S25 23 18.0*
Y-COORD : *E31 53 32.4*

HOLE No: *TB/14*

DERICK PEACOCK ASSOCIATES
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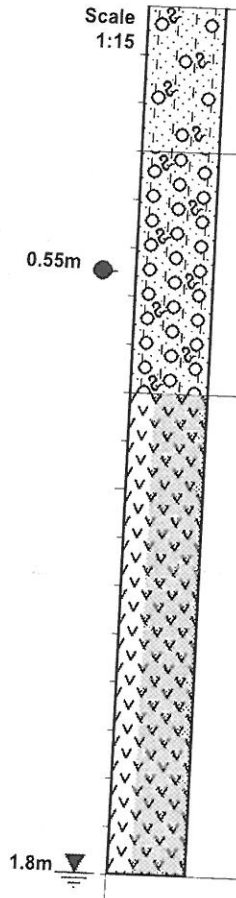
GEOTECHNICAL INVESTIGATION CARRIED OUT FOR:
PROPOSED RESIDENTIAL TOWNSHIP DEVELOPMENT

HOLE No: TB/15
Sheet 1 of 1

JOB NUMBER: M16/3572



0.00	Dry, dark brown, medium dense, slightly voided, silty SAND containing tree roots and abundant rounded QUARTZ GRAVELS; colluvium.
0.30	Abundant coarse, angular, dark yellow, BASALT GRAVELS and isolated small, hard rock CORESTONES, clast supported in a matrix as above; pebble marker. Overall consistency is very loose.
0.80	Dark olive stained orange on joints, highly weathered, very closely jointed, soft rock BASALT.
1.80	

NOTES

1) Gradual refusal of traxcavator at 1,8m in basalt bedrock.
2) Water table standing at 1,8m below surface after two days.
3) Disturbed indicator sample taken at 0,55m.

CONTRACTOR : Local contractor
MACHINE : Traxcavator
DRILLED BY :
PROFILED BY : jvdm

TYPE SET BY : jovdm
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : Trench
DATE : May 2016
DATE : 13/05/2016

DATE : 08/08/2016 20:16
TEXT : ..lot\ARCHIVE\peac3572.txt

ELEVATION :
X-COORD : S25 23 14.9
Y-COORD : E31 53 35.7

HOLE No: TB/15

JOB NO: **91052** **DATE REPORTED :** 2016/06/09

ROADLAB
Civil Engineering Materials Laboratory
(PTY) LTD • 1965/008083/07 • VAT No. 4660115884
Established 1965

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207 Rietfontein Rd Primrose Germiston 1401
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Tel: 011 828 0279 Fax: 011 828 0273
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www.roadlab.co.za

TEST REPORT :

Please find the attached test results for the sample/s as submitted to and tested by Roadlab (Pty)Ltd in Primrose.
The unambiguous description of the sample/s as received are as follows :

SAMPLE INFORMATION & PROPERTIES					
SAMPLE No.		I1588			
CONTAINER USED FOR SAMPLING		Black Sampling Bags			
SIZE / WEIGHT OF SAMPLE		±70kg's			
MOISTURE CONDITION OF SAMPLE ON ARRIVAL		Slightly Moist			
HOLE No. / Km. / CHAINAGE		TB/2			
LAYER TESTED / SAMPLED FROM		0.3-1.3m			
DATE SAMPLED		2016/06/03			
DATE RECEIVED		2016/06/03			
CLIENTS MARKING					
DESCRIPTION OF SAMPLE (COLOUR & TYPE)					
GRADING ANALYSIS - % PASSING SIEVES (TMH1 1986 : METHOD A1 (a)					
SIEVE ANA - LYSIS (mm) **(TMH A1a)**	75.0	100			
	63.0	100			
	53.0	92			
	37.5	89			
	26.5	85			
	19.0	81			
	13.2	69			
	4.75	32			
	2.00	26			
	0.425	13			
	0.075	7			
ATTERBERG LIMITS ANALYSIS (TMH1 1986 : METHOD A2 & A3 ; TMH1 1986, TMHA4 1974)					
ATTERBERG LIMITS **(TMH A2&A3)**	LL%	34.0			
	P.I.	13.0			
	LS%	6.5			
GM		2.54			
CLASSIFI - CATION	H.R.B.*	A-2-6(0)			
	COLTO*	G7			
	T.R.H. 14*	G5			
CALIFORNIA BEARING RATIO (TMH1 1986 : METHOD A7, A8) / UNCONFINED COMPRESSIVE STRENGTH (TMH1 1986 : METHOD A7, A14) (ITS A16T)					
MOD AASHTO **(TMH A7)**	OMC%	7.7			
	MDD(KG/M³)	2336			
C.B.R.	COMP MC	7.9			
	% SWELL	0.08			
U.C.S. **(TMH A13T)** C.B.R. **(TMH A8)**	100%	61			
	98%	47			
	97%	39			
	95%	25			
	93%	25			
	90%	25			
MOD ITS : DRY (kPa) **(A16T)**		N/A			
PROCTOR ITS : DRY (kPa)		N/A			
STABILISED WITH	IN LAB				
	ON SITE	Neat			
TEST TYPE		F/IND - CBR			
SAMPLED BY		Roadlab			
DELIVERED BY		Roadlab			
SAMPLED ACCORDING TO		Clients Requirements			
ENVIRONMENTAL CONDITION WHEN SAMPLED		Sunny			
REMARKS & NOTES		*Colto didn't classify as G5 due to GM being >2.5			

TESTED BY : **SAMPLING METHOD :**
ROAD / AREA TESTED : **TEST METHOD :**
LAYER TESTED : **DATE TESTED :**
TRACK NO: **WEATHER CONDITIONS:**

TEST POSITION	DEPTH TESTED	FIELD DENSITY(kg/m3) WET DENSITY	DRY DENSITY	FIELD MOISTURE(%)	AASHTO TMH A7 MDD(kg/m³)	OMC(%)	
					AVERAGE COMPACTION:		

MOISTURE CONTENT

SAMPLE NO	HOLE	LAYER	% MOISTURE	TIN NO	

 # MOD SAMPLE TAKEN AT THIS POINT/ PREVIOUS LAYER TESTED FOR MOD

sanas Testing Laboratory

Accreditation No.: T0296

RL-S-150-01

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91052 2016/06/23

Johan van der Merwe

P.O Box 95562

Waterkloof

'0145

Email: jovdm@iafrica.com

Sample Number : I1597

DETERMINATION OF CORROSIVITY OF WATER SAMPLES

LANGELIER SATURATION AND RYZNAR STABILITY INDICES, AGGRESSIVENESS INDEX AND CHLORIDE + SULPHATE TO ALKALINITY CORROSIVITY RATIO

1.1 CHEMICAL ANALYSIS Results are in mg/l unless otherwise stated.		1.2 **CORROSIVITY INDICES**	
DETERMINAND:	I1597 TB/14 – 1.5m	INDEX	VALUE
pH	7.6	Stability pH (pHs) at 20°C	7.1
Conductivity (mS/m)	87	Langelier Index at 20°C	0.5
Total dissolved solids (Calculated)	566	Ryznar Stability Index at 20°C	6.6
		Aggressiveness Index	10.3
Total Hardness as $CaCO_3$	340	Cl and SO_4 Corrosivity Index	0.4
Calcium Hardness as $CaCO_3$	210	(Corrosivity Ratio)	
Calcium as Ca	84		
Calcium as Mg	32		
Total alkalinity as $CaCO_3$	280		
Chloride as Cl	50		
Sulphate as SO_4	52		

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2. INTERPRETATION OF CORROSIVITY INDICES

2.1 AGGRESSIVENESS TOWARDS CONCRETE AND FIBRE CEMENT PIPES

INDEX	AGGRESSIVE	NEUTRAL	NON-AGGRESSIVE	**COMMENTS**
a)Stability pH, pHs	< pH	=pH	>pH	**The corrosivity indices that the water is not corrosive towards concrete but it is corrosive towards metals.**
b)Langelier Index	NEG. VALUE	ZERO	POS. VALUE	
c)Ryznar Index	'> 7.5	6 – 7	< 6	
d)Aggressiveness Indes, AI	< 10	10 - 12	'> 12	**The Basson Index indicates that the water is non to mildly aggressive towards concrete.**

2.2 CORROSIVENESS TOWARDS METALS

	CORROSIVE
CORROSIVITY RATIO	➢ 0.2

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DETERMINATION OF CORROSIVITY OF WATER SAMPLES

AGGRESSIVENESS TOWARDS CONCRETE : AGGRESSIVENESS INDEX

(PORTLAND CEMENT INSTITUTE – J.J BASSON PUBLICATION)

DETERMINAND	VALUE	CONTENT	INDEX
pH	7.6	200	380
Calcium Carbonate Saturated pH	7.1	-2000	-1000
Calcium Hardness as $CaCO_3$	210	2.2	638
Total Ammonium as NH_4	0.4	10	4
Magnesium as MG	32	0.6	19
Sulphates as SO_4	52	0.3	15.6
Chloride as Cl	50	0.2	10
Total Dissolved Solids	566		
Leaching – corrosion sub-index, LCSI			**6**
Spalling – corrosion sub-index, SCSI			**13**
Final aggressiveness index at 25 Degr. C, corrected for stagnant conditions, Nc			**16**

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Guidelines for assessing final index

FINAL INDEX	AGGRESSIVENESS	RECOMMENDATION
Under 350	Non to mildly aggressive	Use concrete class as required for structural design
350 - 750	Mildly to fairly aggressive	Good concrete design and construction essential
750 – 1000	Highly aggressive	Identify dominant corrosion sub-index Follow recommendations
Over 1000	Very highly corrosive	Do not use in contact with unprotected concrete

Kind Regards

Willem Cockcroft

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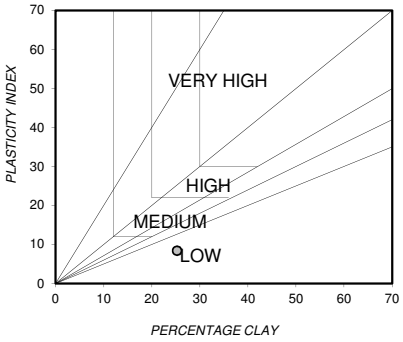
OUR REF : 91052 **DATE RECEIVED :** 07-Jun-16
CLIENT : Johan van der Merwe **CHAINAGE :** TB/2
SITE : Portion 101 - Ten Bosch **LAYER :** 0-0.2m
SAMPLE No. : I1587
SAMPLE DESCRIPTION : Dark Brown Clayey Silty Sand

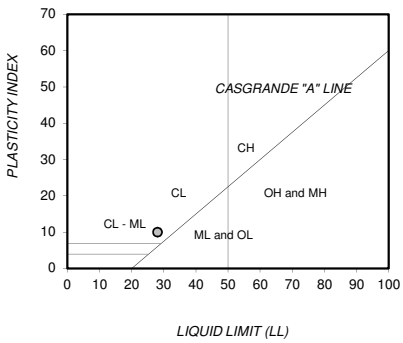
*FOUNDATION INDICATOR RESULTS (TMH 1 : A1, A2, A3, A4, A5 & *SANS 3001-GR3:2014)*

Weighted PI		**8.4**
Sieve analysis Cumulative percentage passing (mm)	75.0	100
	63.0	100
	53.0	100
	37.5	100
	26.5	100
	19.0	99
	13.2	98
	4.75	96
	2.000	93
	0.425	84
	0.250	78
	0.150	67
	0.075	53
	0.050*	34
	0.005*	27
	0.002*	25.3
Soil Mortar Analysis % < 2.00mm	2.000 - 0.425	10
	0.425 - 0.250	6
	0.250 - 0.150	11
	0.150 - 0.075	16
	< 0.075	57
Effective size		0.002
Uniformity Coefficient		55.8
Curvature Coefficient		2.8
Oversize Index		0.0
Shrinkage Product		397.3
Grading Coefficient		6.7
Grading modulus		0.70
Atter-berg Limits	Liquid Limit	28
	Plasticity Index	10
	Linear Shrinkage	4.7
	PI < 0.075	17
Unified Soil Classification		ML
U.S. Highway Classification		A-4(4)
pH - Value		N/A
Conductivity mS/cm		N/A

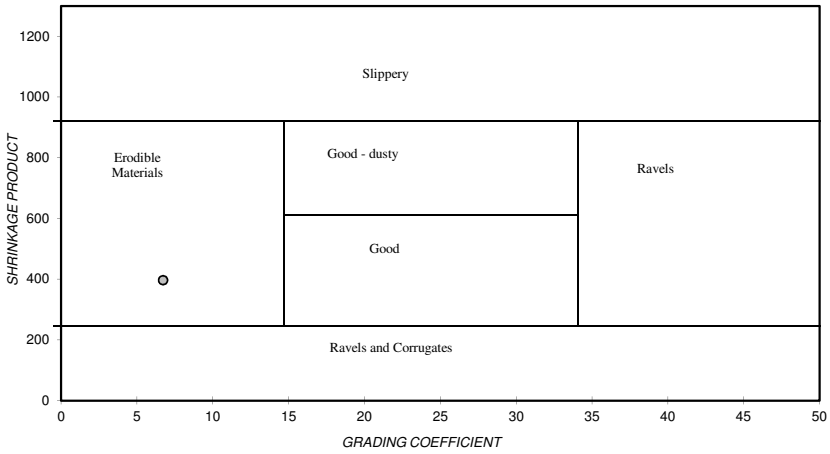
POTENTIAL EXPANSION



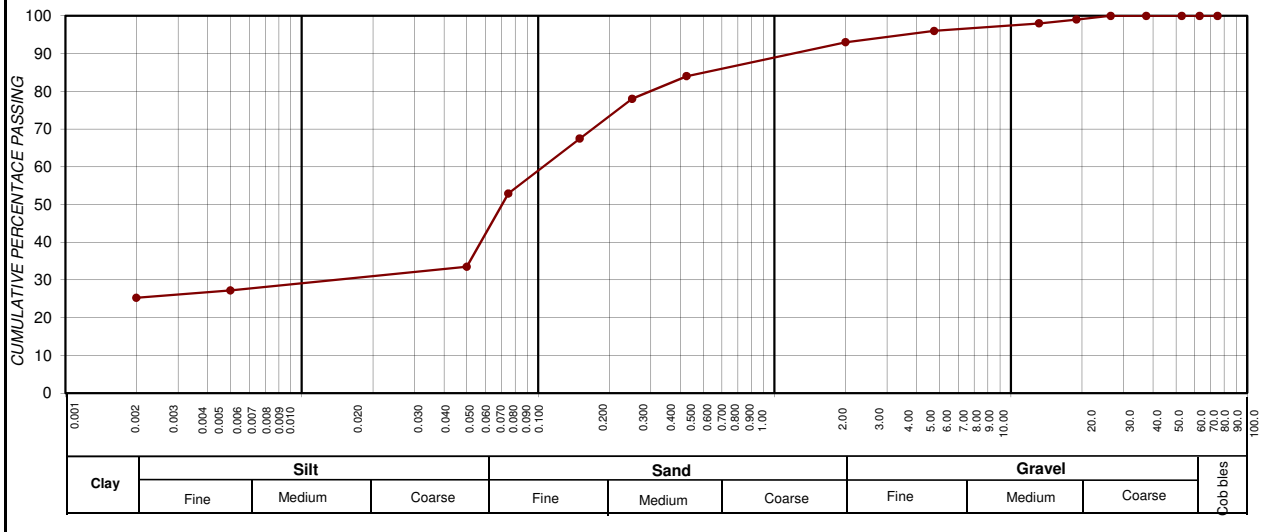
PLASTICITY CHART



PERFORMANCE AS WEARING COURSE



SIEVE GRADING



SIEVE SIZE (BY LOG SCALE)

CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
25.3	27.7	40.0	7.0

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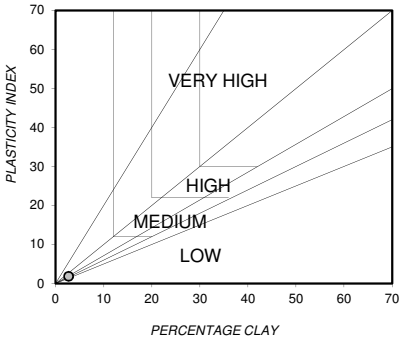
OUR REF : 91052 **DATE RECEIVED :** 07-Jun-16
CLIENT : Johan van der Merwe **CHAINAGE :** TB/4
SITE : Portion 101 - Ten Bosch **LAYER :** 0.6-1.6m
SAMPLE No. : I1589
SAMPLE DESCRIPTION : Dark Brown Sandy Gravel

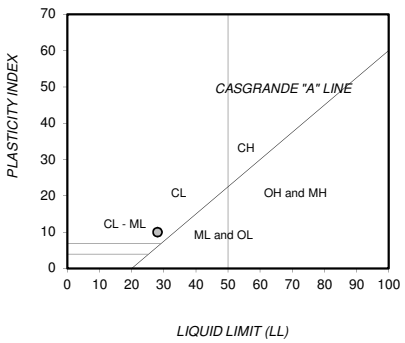
FOUNDATION INDICATOR RESULTS (TMH 1 : A1, A2, A3, A4, A5 & *SANS 3001-GR3:2014)

Weighted PI		**1.8**
Sieve analysis Cumulative percentage passing (mm)	75.0	100
	63.0	100
	53.0	100
	37.5	100
	26.5	96
	19.0	93
	13.2	90
	4.75	81
	2.000	48
	0.425	18
	0.250	15
	0.150	12
	0.075	10
	0.050*	4
	0.005*	3
	0.002*	2.7
Soil Mortar Analysis % < 2.00mm	2.000 - 0.425	63
	0.425 - 0.250	7
	0.250 - 0.150	5
	0.150 - 0.075	5
	< 0.075	21
Effective size		0.075
Uniformity Coefficient		39.9
Curvature Coefficient		4.9
Oversize Index		0.0
Shrinkage Product		92.2
Grading Coefficient		38.4
Grading modulus		2.23
Atter-berg Limits	Liquid Limit	25
	Plasticity Index	10
	Linear Shrinkage	5.1
	PI < 0.075	15
Unified Soil Classification		SW-SP
U.S. Highway Classification		A-2-4(0)
pH - Value		N/A
Conductivity mS/cm		N/A

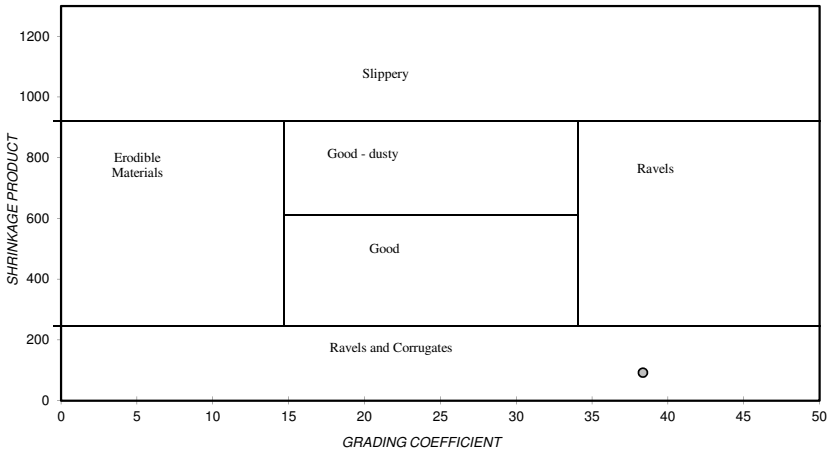
POTENTIAL EXPANSION



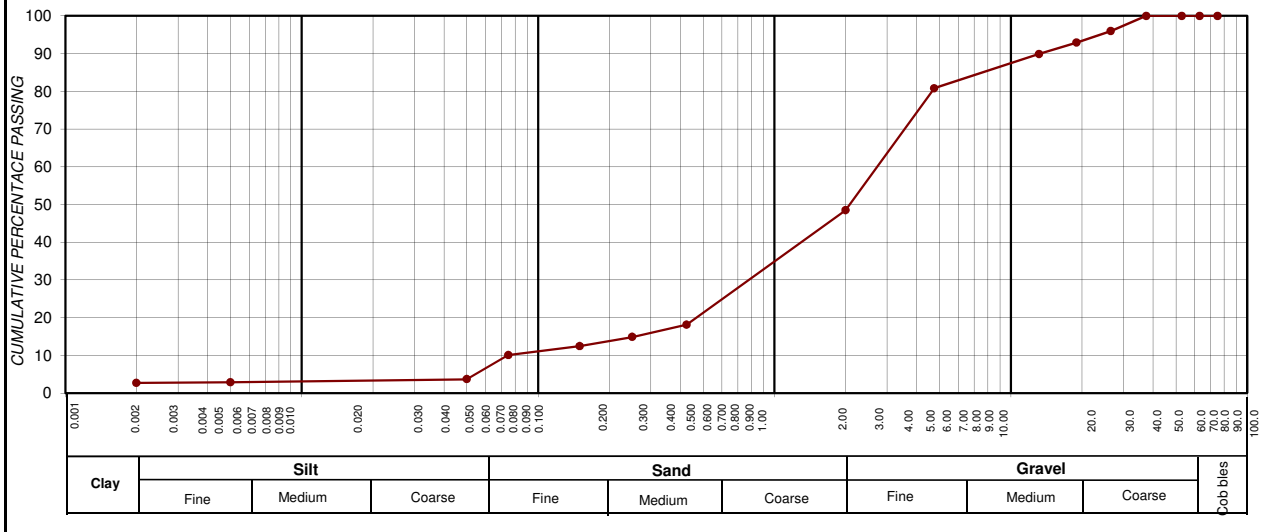
PLASTICITY CHART



PERFORMANCE AS WEARING COURSE



SIEVE GRADING



CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
2.7	7.3	38.5	51.5

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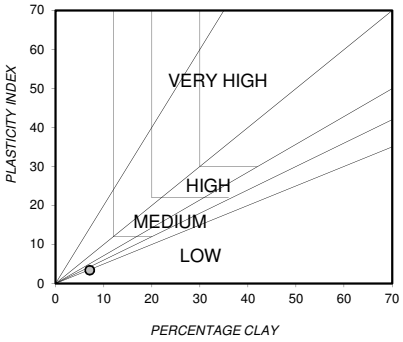
OUR REF : 91052 **DATE RECEIVED :** 07-Jun-16
CLIENT : Johan van der Merwe **CHAINAGE :** TB 5
SITE : Portion 101 - Ten Bosch **LAYER :** 0-0.3m
SAMPLE No. : I1590
SAMPLE DESCRIPTION : Dark Brown Silty Sandy Gravel

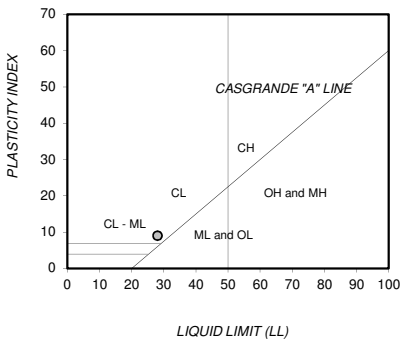
*FOUNDATION INDICATOR RESULTS (TMH 1 : A1, A2, A3, A4, A5 & *SANS 3001-GR3:2014)*

Weighted PI		**3.4**
Sieve analysis Cumulative percentage passing (mm)	75.0	100
	63.0	100
	53.0	100
	37.5	100
	26.5	91
	19.0	87
	13.2	84
	4.75	71
	2.000	57
	0.425	37
	0.250	31
	0.150	26
	0.075	20
	0.050*	11
	0.005*	8
	0.002*	7.1
Soil Mortar Analysis % < 2.00mm	2.000 - 0.425	34
	0.425 - 0.250	11
	0.250 - 0.150	8
	0.150 - 0.075	11
	< 0.075	36
Effective size		0.035
Uniformity Coefficient		76.2
Curvature Coefficient		0.6
Oversize Index		0.0
Shrinkage Product		161.8
Grading Coefficient		24.3
Grading modulus		1.86
Atter-berg Limits	Liquid Limit	27
	Plasticity Index	9
	Linear Shrinkage	4.3
	PI < 0.075	16
Unified Soil Classification		SC
U.S. Highway Classification		A-2-4(0)
pH - Value		N/A
Conductivity mS/cm		N/A

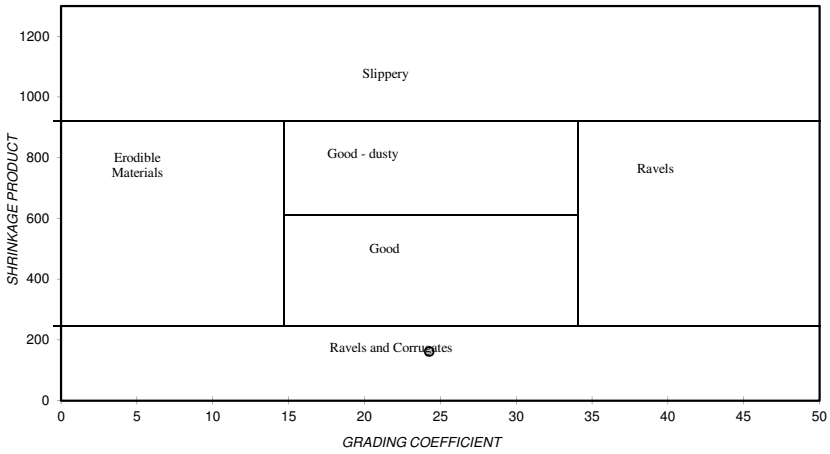
POTENTIAL EXPANSION



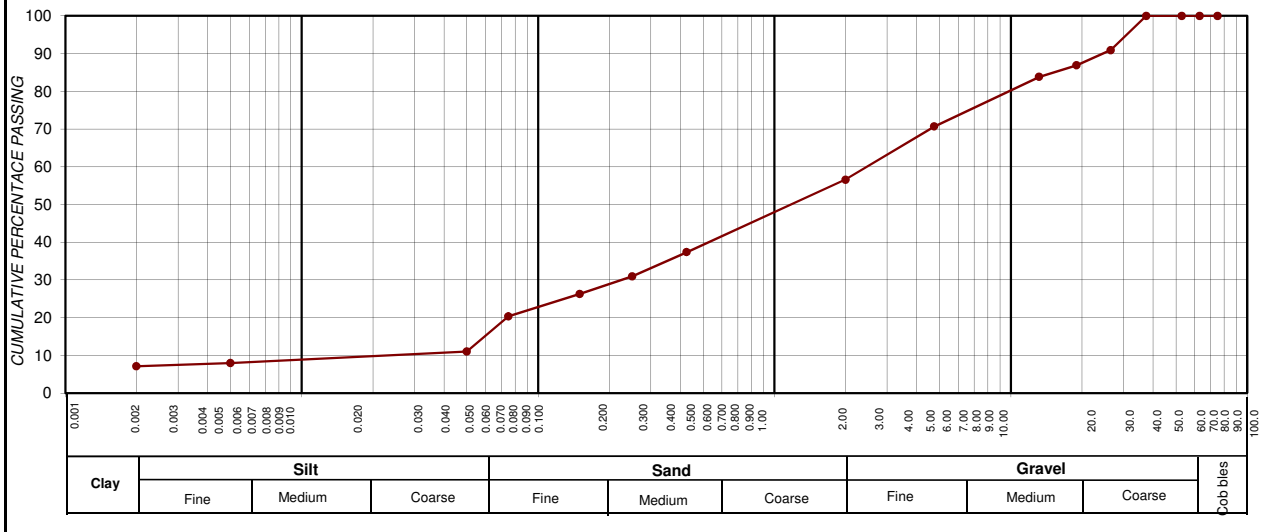
PLASTICITY CHART



PERFORMANCE AS WEARING COURSE



SIEVE GRADING



SIEVE SIZE (BY LOG SCALE)

CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
7.1	12.9	36.6	43.4

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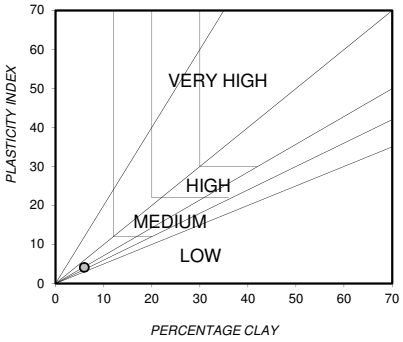
OUR REF : 91052 **DATE RECEIVED :** 07-Jun-16
CLIENT : Johan van der Merwe **CHAINAGE :** TB/5
SITE : Portion 101 - Ten Bosch **LAYER :** 0.3-0.8m
SAMPLE No. : I1591
SAMPLE DESCRIPTION : Dark Brown Silty Sandy Gravel

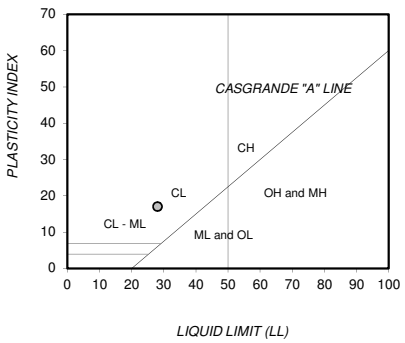
*FOUNDATION INDICATOR RESULTS (TMH 1 : A1, A2, A3, A4, A5 & *SANS 3001-GR3:2014)*

Weighted PI		**4.1**
Sieve analysis Cumulative percentage passing (mm)	75.0	100
	63.0	100
	53.0	100
	37.5	100
	26.5	100
	19.0	98
	13.2	96
	4.75	75
	2.000	41
	0.425	24
	0.250	21
	0.150	20
	0.075	18
	0.050*	11
	0.005*	8
	0.002*	6.0
Soil Mortar Analysis % < 2.00mm	2.000 - 0.425	41
	0.425 - 0.250	7
	0.250 - 0.150	4
	0.150 - 0.075	4
	< 0.075	44
Effective size		0.035
Uniformity Coefficient		101.1
Curvature Coefficient		7.8
Oversize Index		0.0
Shrinkage Product		204.7
Grading Coefficient		44.3
Grading modulus		2.17
Atter-berg Limits	Liquid Limit	42
	Plasticity Index	17
	Linear Shrinkage	8.5
	PI < 0.075	26
Unified Soil Classification		SC
U.S. Highway Classification		A-2-7(0)
pH - Value		N/A
Conductivity mS/cm		N/A

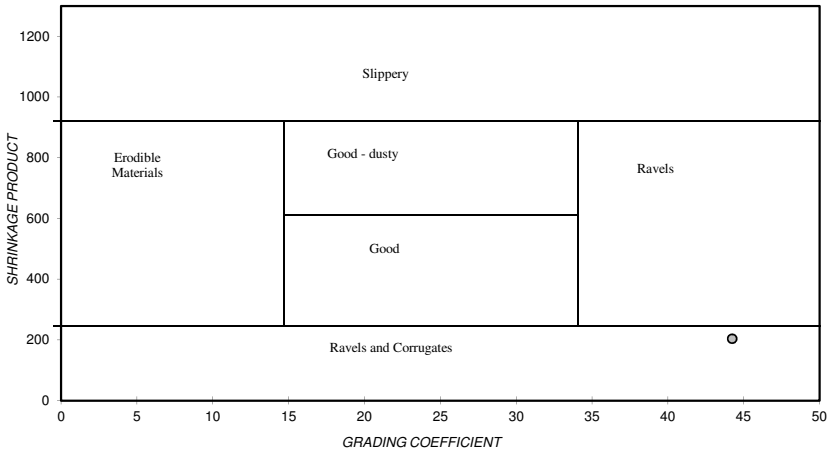
POTENTIAL EXPANSION



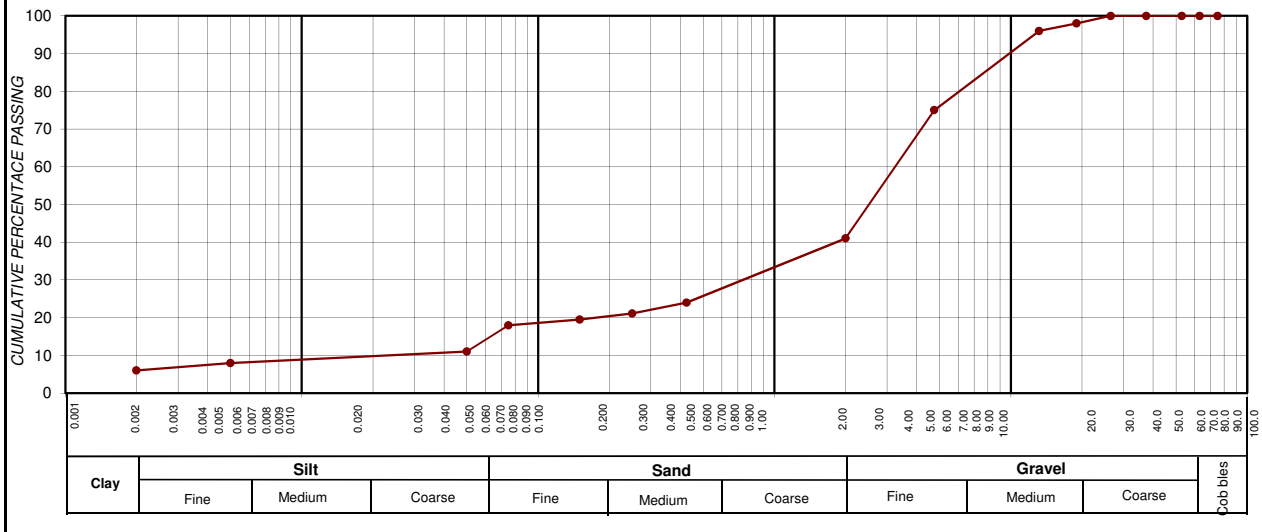
PLASTICITY CHART



PERFORMANCE AS WEARING COURSE



SIEVE GRADING



CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
6.0	12.0	23.0	59.0

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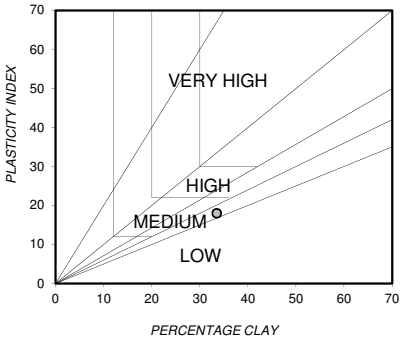
OUR REF : 91052 **DATE RECEIVED :** 07-Jun-16
CLIENT : Johan van der Merwe **CHAINAGE :** TB/8
SITE : Portion 101 - Ten Bosch **LAYER :** 0-0.6m
SAMPLE No. : I1592
SAMPLE DESCRIPTION : Dark Brown Sandy Clayey Silt

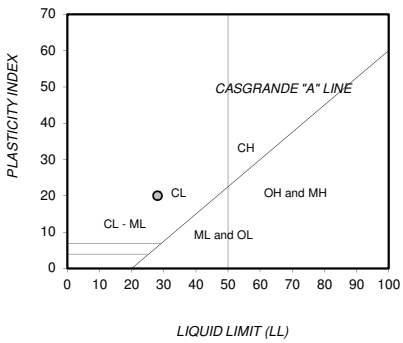
FOUNDATION INDICATOR RESULTS (TMH 1 : A1, A2, A3, A4, A5 & *SANS 3001-GR3:2014)

Weighted PI		**18.0**
Sieve analysis Cumulative percentage passing (mm)	75.0	100
	63.0	100
	53.0	100
	37.5	100
	26.5	100
	19.0	100
	13.2	100
	4.75	99
	2.000	95
	0.425	90
	0.250	87
	0.150	77
	0.075	68
	0.050*	39
	0.005*	34
	0.002*	33.5
Soil Mortar Analysis % < 2.00mm	2.000 - 0.425	5
	0.425 - 0.250	4
	0.250 - 0.150	11
	0.150 - 0.075	9
	< 0.075	71
Effective size		0.002
Uniformity Coefficient		34.2
Curvature Coefficient		0.0
Oversize Index		0.0
Shrinkage Product		900.0
Grading Coefficient		5.0
Grading modulus		0.47
Atter-berg Limits	Liquid Limit	50
	Plasticity Index	20
	Linear Shrinkage	10.0
	PI < 0.075	22
Unified Soil Classification		CH
U.S. Highway Classification		A-7-5(12)
pH - Value		N/A
Conductivity mS/cm		N/A

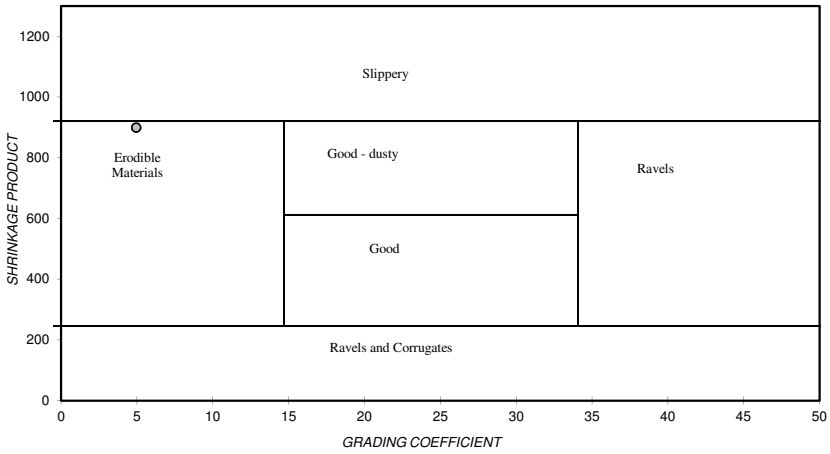
POTENTIAL EXPANSION



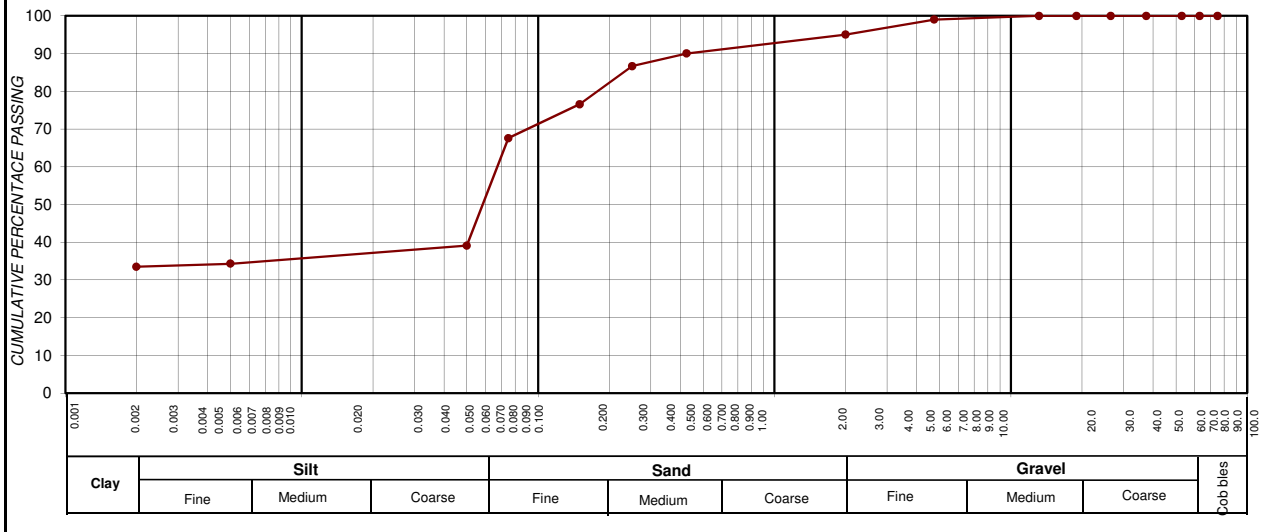
PLASTICITY CHART



PERFORMANCE AS WEARING COURSE



SIEVE GRADING



CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
33.5	**34.5**	**27.0**	**5.0**

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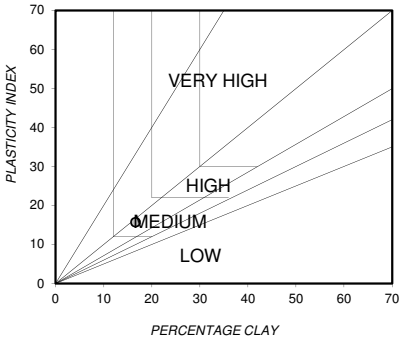
OUR REF : 91052 **DATE RECEIVED :** 07-Jun-16
CLIENT : Johan van der Merwe **CHAINAGE :** TB/8
SITE : Portion 101 - Ten Bosch **LAYER :** 0.6-1.2m
SAMPLE No. : I1593
SAMPLE DESCRIPTION : Dark Brown Gravelly Clayey Sandy Silt

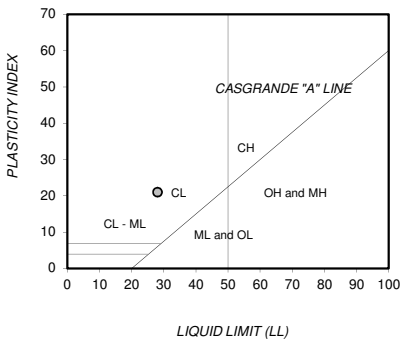
*FOUNDATION INDICATOR RESULTS (TMH 1 : A1, A2, A3, A4, A5 & *SANS 3001-GR3:2014)*

Weighted PI		**15.7**
Sieve analysis Cumulative percentage passing (mm)	75.0	100
	63.0	100
	53.0	100
	37.5	100
	26.5	100
	19.0	100
	13.2	100
	4.75	96
	2.000	86
	0.425	75
	0.250	71
	0.150	65
	0.075	56
	0.050*	22
	0.005*	18
	0.002*	16.6
Soil Mortar Analysis % < 2.00mm	2.000 - 0.425	13
	0.425 - 0.250	5
	0.250 - 0.150	7
	0.150 - 0.075	9
	< 0.075	66
Effective size		0.002
Uniformity Coefficient		54.3
Curvature Coefficient		14.4
Oversize Index		0.0
Shrinkage Product		784.8
Grading Coefficient		13.6
Grading modulus		0.83
Atter-berg Limits	Liquid Limit	43
	Plasticity Index	21
	Linear Shrinkage	10.5
	PI < 0.075	23
Unified Soil Classification		CL
U.S. Highway Classification		A-7-5(11)
pH - Value		N/A
Conductivity mS/cm		N/A

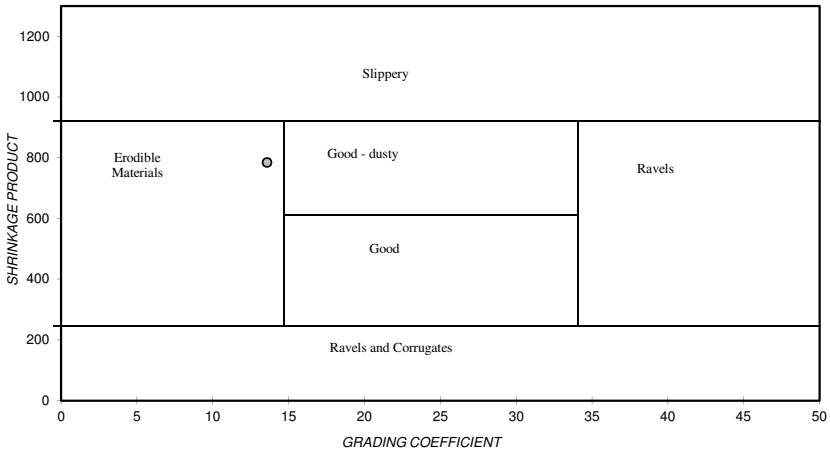
POTENTIAL EXPANSION



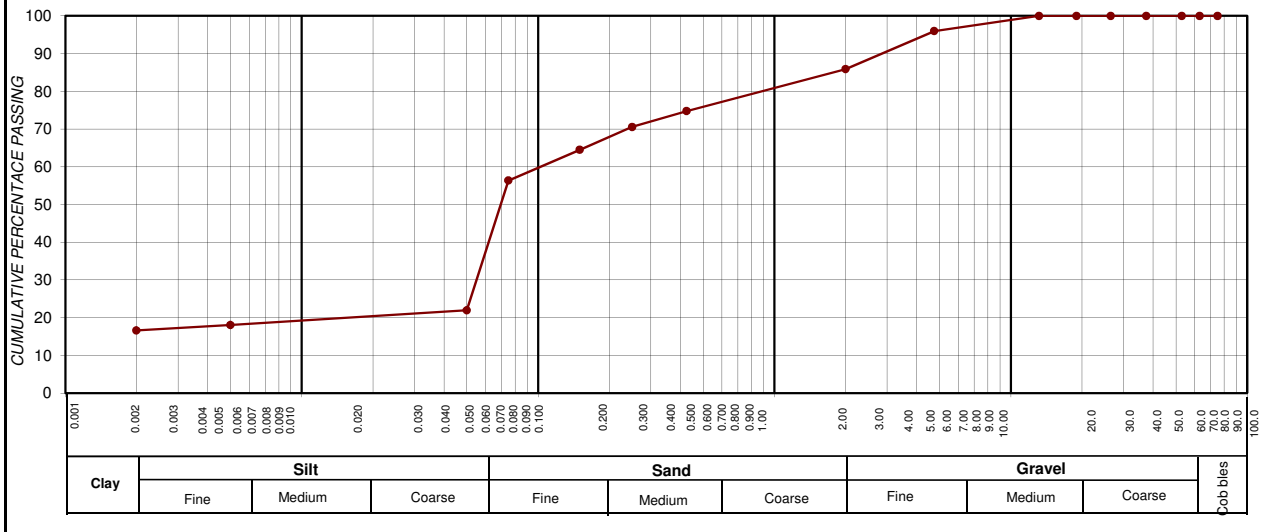
PLASTICITY CHART



PERFORMANCE AS WEARING COURSE



SIEVE GRADING



SIEVE SIZE (BY LOG SCALE)

CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
16.6	39.4	29.9	14.1

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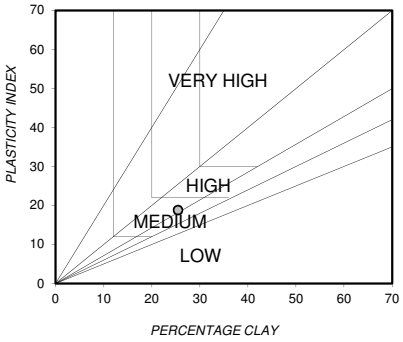
OUR REF : 91052 **DATE RECEIVED :** 07-Jun-16
CLIENT : Johan van der Merwe **CHAINAGE :** TB/9
SITE : Portion 101 - Ten Bosch **LAYER :** 1.2-1.8m
SAMPLE No. : I1594
SAMPLE DESCRIPTION : Dark Red Brown Clayey Silty Sand

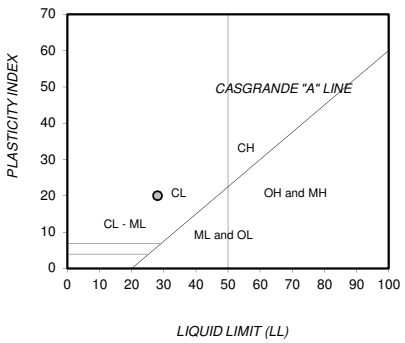
FOUNDATION INDICATOR RESULTS (TMH 1 : A1, A2, A3, A4, A5 & *SANS 3001-GR3:2014)

Weighted PI		**18.8**
Sieve analysis Cumulative percentage passing (mm)	75.0	100
	63.0	100
	53.0	100
	37.5	100
	26.5	100
	19.0	100
	13.2	99
	4.75	96
	2.000	95
	0.425	94
	0.250	87
	0.150	75
	0.075	58
	0.050*	29
	0.005*	26
	0.002*	25.5
Soil Mortar Analysis % < 2.00mm	2.000 - 0.425	1
	0.425 - 0.250	7
	0.250 - 0.150	13
	0.150 - 0.075	18
	< 0.075	61
Effective size		0.002
Uniformity Coefficient		42.2
Curvature Coefficient		15.4
Oversize Index		0.0
Shrinkage Product		930.6
Grading Coefficient		4.8
Grading modulus		0.53
Atter-berg Limits	Liquid Limit	42
	Plasticity Index	20
	Linear Shrinkage	9.9
	PI < 0.075	24
Unified Soil Classification		CL
U.S. Highway Classification		A-7-5(11)
pH - Value		N/A
Conductivity mS/cm		N/A

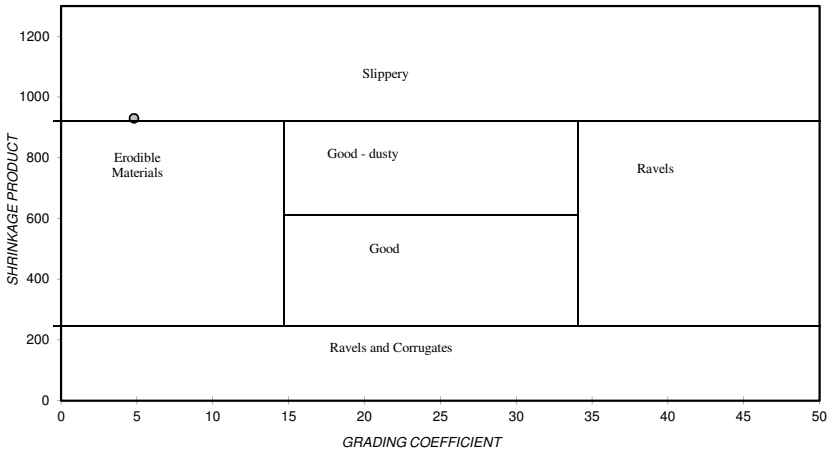
POTENTIAL EXPANSION



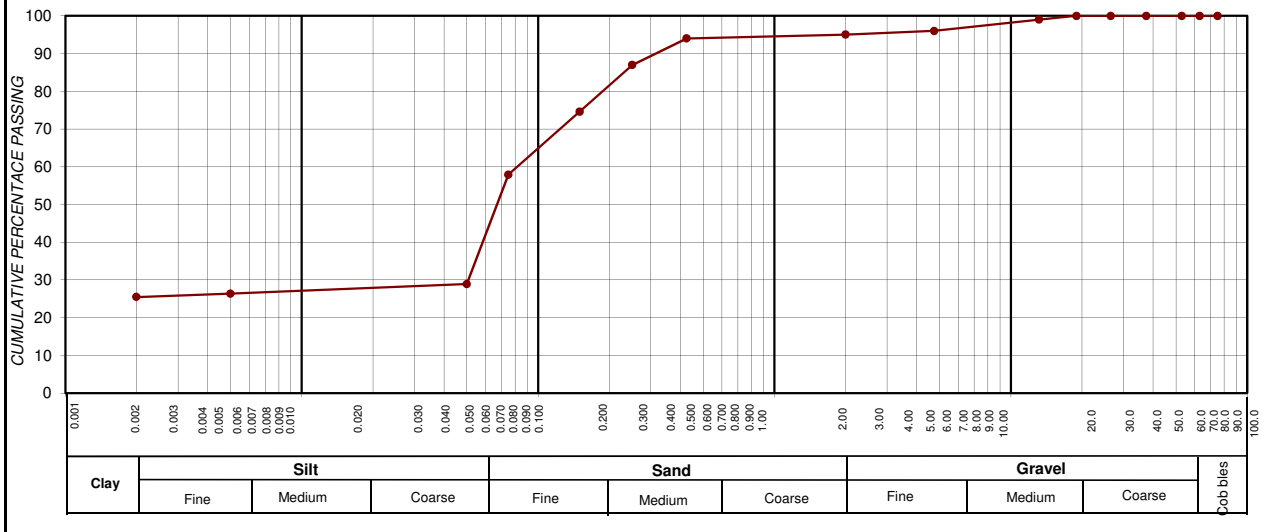
PLASTICITY CHART



PERFORMANCE AS WEARING COURSE



SIEVE GRADING



CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
25.5	32.5	37.0	5.0

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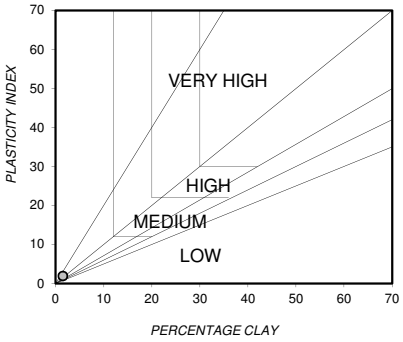
OUR REF : 91052 **DATE RECEIVED :** 07-Jun-16
CLIENT : Johan van der Merwe **CHAINAGE :** TB/2
SITE : Portion 101 - Ten Bosch **LAYER :** 0.6-1.8m
SAMPLE No. : I1596
SAMPLE DESCRIPTION : Dark Yellow Sandy Gravel

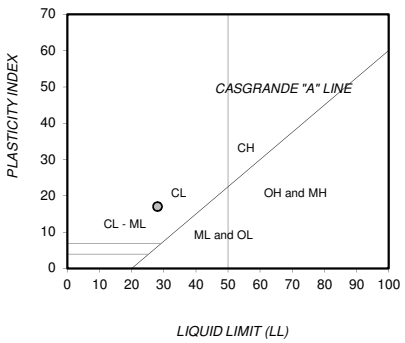
*FOUNDATION INDICATOR RESULTS (TMH 1 : A1, A2, A3, A4, A5 & *SANS 3001-GR3:2014)*

Weighted PI		**1.9**
Sieve analysis Cumulative percentage passing (mm)	75.0	100
	63.0	100
	53.0	100
	37.5	91
	26.5	83
	19.0	71
	13.2	56
	4.75	28
	2.000	18
	0.425	11
	0.250	10
	0.150	9
	0.075	7
	0.050*	3
	0.005*	2
	0.002*	1.5
Soil Mortar Analysis % < 2.00mm	2.000 - 0.425	39
	0.425 - 0.250	6
	0.250 - 0.150	7
	0.150 - 0.075	9
	< 0.075	39
Effective size		0.273
Uniformity Coefficient		53.5
Curvature Coefficient		7.4
Oversize Index		8.9
Shrinkage Product		90.4
Grading Coefficient		18.1
Grading modulus		2.64
Atter-berg Limits	Liquid Limit	42
	Plasticity Index	17
	Linear Shrinkage	8.3
	PI < 0.075	24
Unified Soil Classification		GW-GP
U.S. Highway Classification		A-2-7(0)
pH - Value		N/A
Conductivity mS/cm		N/A

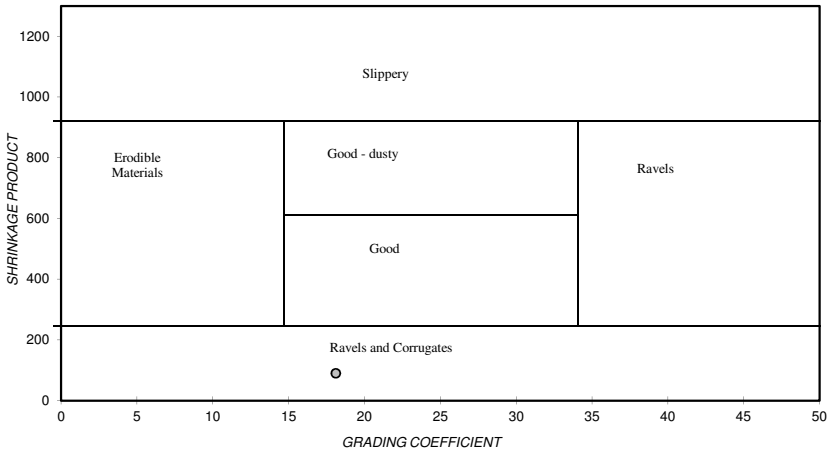
POTENTIAL EXPANSION



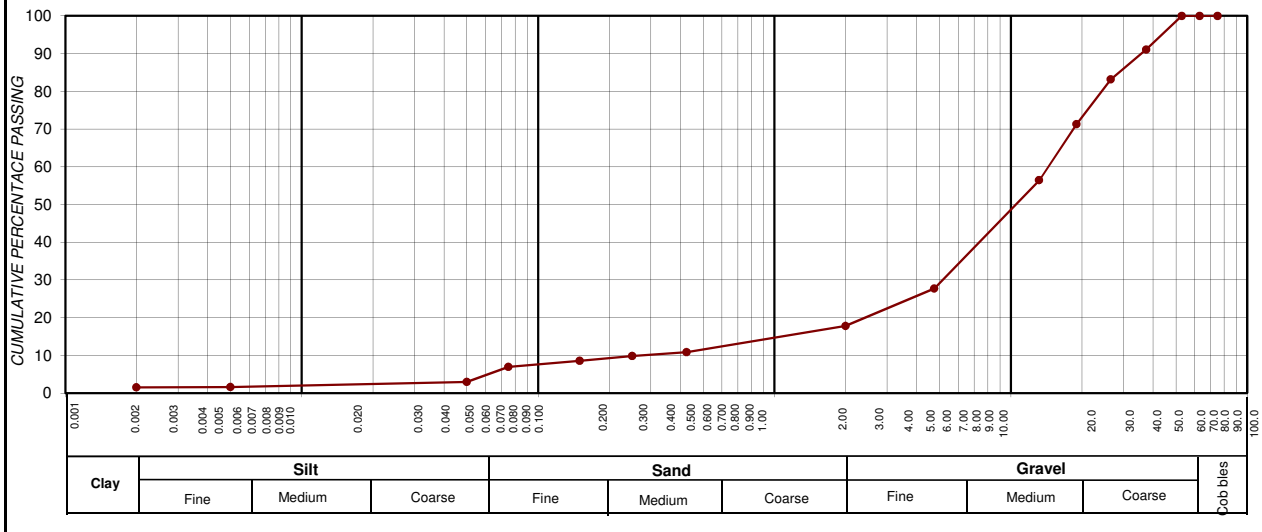
PLASTICITY CHART



PERFORMANCE AS WEARING COURSE



SIEVE GRADING



CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
1.5	5.5	10.8	82.2

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91052 2016/06/23

Johan van der Merwe (Pty) Ltd
P.O. Box 95562
Waterkloof
0145

Attention : Mr Johan van der Merwe

Sample Number : I1597

Depth : TB/14 - 1.5

				SOUTH AFRICAN DRINKING WATER STANDARDS SANS 241 - 1 : 2015 ABBREVIATED	
CHEMICAL TESTS	UNIT	HEALTH/AESTHETIC RISK		STANDARD LIMITS	
pH	-	Operational	7.6	≥5 to ≤ 9.7	**Acute health - 1:** Determinand that poses an immediate unacceptable health risk if consumed with concentration values exceeding the numerical limits in this part of SANS 241. **Chronic health:** Determinand that poses an unacceptable health risk if ingested over an extended period if present at concentration values exceeding the numerical limits in this part of SANS 241. **Aesthetic:** Determinand that taints water with respect to taste, odour and colour and does not pose an unacceptable health risk if present at concentration values exceeding the numerical limits in this part of SANS 241. **Operational:** Determinand that is essential for assessing the efficient operation of treatment systems and risk to infrastructure.
Electrical conductivity at 25°C	mS/m	Aesthetic	87	≤ 170	
Total dissolved solids	mg/l	Aesthetic	533	≤ 1200	
Turbidity	NTU	Aesthetic / Operational	18.9	≤ 1 / ≤ 5	
Colour	Hazen	Aesthetic	30	≤ 15	
Suspended solids	mg/l	-	24	-	
Total hardness as $CaCO_3$	mg/l	-	340	-	
Calcium hardness as $CaCO_3$	mg/l	-	210	-	
Magnesium hardness as $CaCO_3$	mg/l	-	130	-	
Total alkalinity as $CaCO_3$	mg/l	-	280	-	
Sodium	mg/l	Aesthetic	30	≤ 200	
Calcium	mg/l	-	84	-	
Magnesium	mg/l	-	32	-	
Chloride	mg/l	Aesthetic	50	≤ 300	
Sulphate	mg/l	Acute health / Aesthetic	52	≤ 500 / ≤ 250	
Nitrate	mg/l	Acute health	6	≤ 11	
Fluoride	mg/l	Chronic health	0.5	≤ 1.5	
BACTRIOLOGICAL TESTS					
Heterotrophic plate count	cfu/ml	Operational	660	≤ 1000	
Faecal coliforms	cfu/100ml	Acute health	0	Not detected	

COMMENTS : The water is turbid and coloured but of good bacteriological and chemical quality.
The water is suitable for human consumption.

Kind Regards

Willem Cockcroft

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91052 2016/06/13

Johan van der Merwe
PO Box

ATTENTION: Mr. J van der Merwe

Test Report : **PORTION 101 TEN BOSCH - pH & CONDUCTIVITY TEST RESULTS**

Clients Marking: None
Sample Number: I1588 - I1594
Sample delivered to: Roadlab

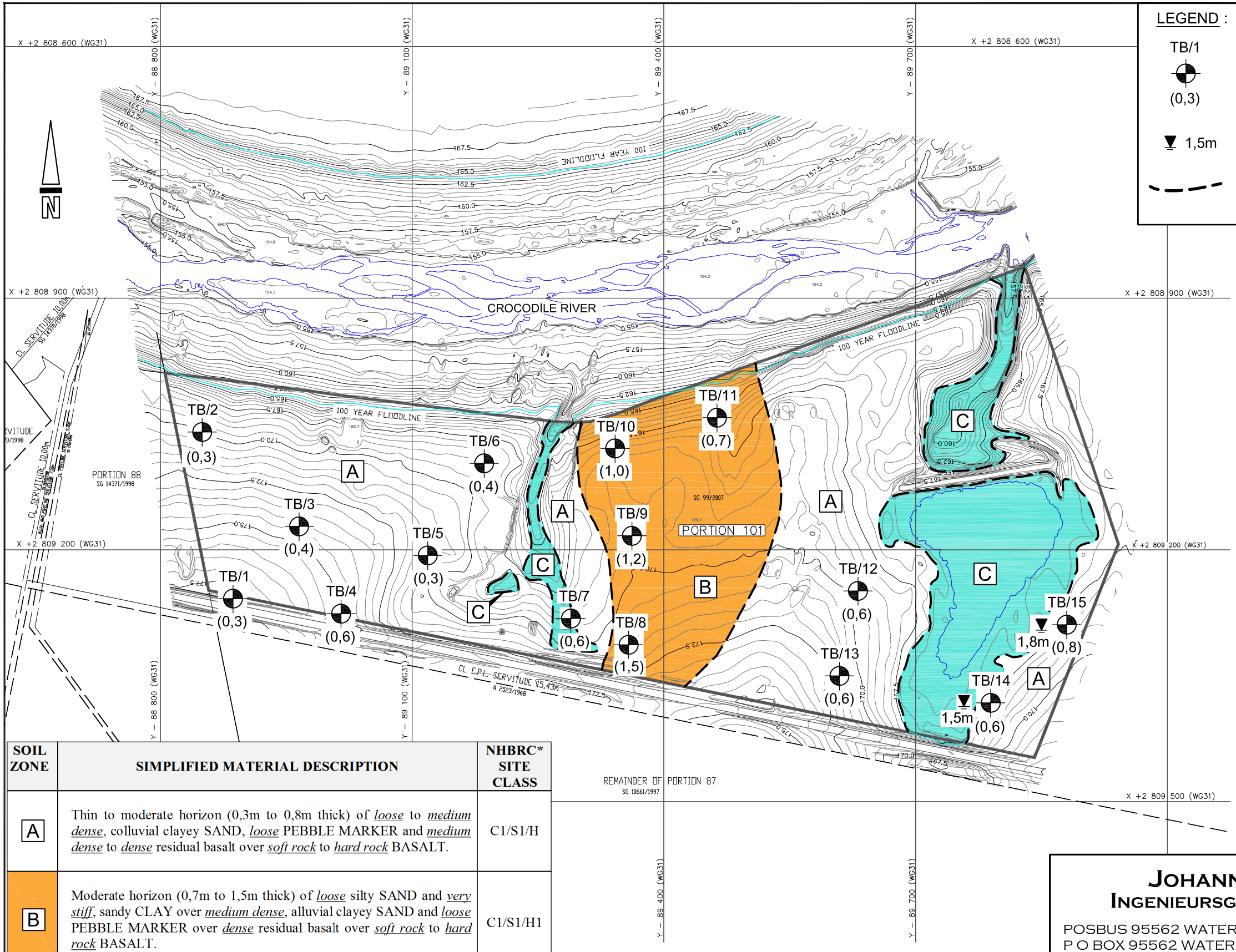
Date Sampled: 2016/06/08
Date Received: 2016/06/08

Sample Number	Layer / Road :	Temperature (°C) : Conductivity	Conductivity (ms/m)	Temperature (°C) : pH	pH Value
I1588	TB/2: 0.3-1.3m	25.0	4.83	25.0	7.33
I1591	TB/5: 0.3-0.8m	25.0	60.10	25.0	6.88
I1596	TB/12: 0.6-1.8m	25.0	46.40	25.0	6.83
I1587	TB/2: 0-0.2m	25.0	65.51	25.0	6.73
I1592	TB/8: 0-0.6m	25.0	152.90	25.0	7.07
I1589	TB/4: 0.6-1.6m	25.0	37.00	25.0	6.96
I1593	TB/8: 0.6-1.2m	25.0	84.31	25.0	7.39
I1590	TB/5: 0-0.3m	25.0	35.20	25.0	6.96
I1595	TB/11: 0-0.7m	25.0	32.50	25.0	7.02
I1594	TB/9: 1.2-1.8m	25.0	121.00	25.0	7.43

Kind Regards

Mr N Herbst
TECHNICAL SIGNATORY

Remarks :
The samples were subjected to analysis according to TMH 1
The results reported relate only to the sample tested
Further use of the above information is not the responsibility or liability of Roadlab
Documents may only be reproduced or published in their full context
Compiled By : Linda van Niekerk



LEGEND :

TB/1	TEST PIT BY BACKACTOR, POSITION AND NUMBER
(0,3)	SHOWING THICKNESS OF POTENTIALLY COMPRESSIBLE, COLLAPSIBLE AND SLIGHTLY EXPANSIVE HORIZON IN METRES
▼ 1,5m	WATER STANDING IN TEST PIT IN M.B.G.L.
	MATERIAL BOUNDARY**

SOIL ZONE	SIMPLIFIED MATERIAL DESCRIPTION	NHBRC* SITE CLASS
A	Thin to moderate horizon (0,3m to 0,8m thick) of *loose* to *medium dense*, colluvial clayey SAND, *loose* PEBBLE MARKER and *medium dense* to *dense* residual basalt over *soft rock* to *hard rock* BASALT.	C1/S1/H
B	Moderate horizon (0,7m to 1,5m thick) of *loose* silty SAND and *very stiff*, sandy CLAY over *medium dense*, alluvial clayey SAND and *loose* PEBBLE MARKER over *dense* residual basalt over *soft rock* to *hard rock* BASALT.	C1/S1/H1
C	Low-lying areas occupied by perennial and non-perennial drainage features where seasonal flooding may occur.	P

NOTE :

* =*National Home Builders Registration Council (NHBRC).*

** =*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.*

JOHANN VAN DER MERWE (PTY) LTD
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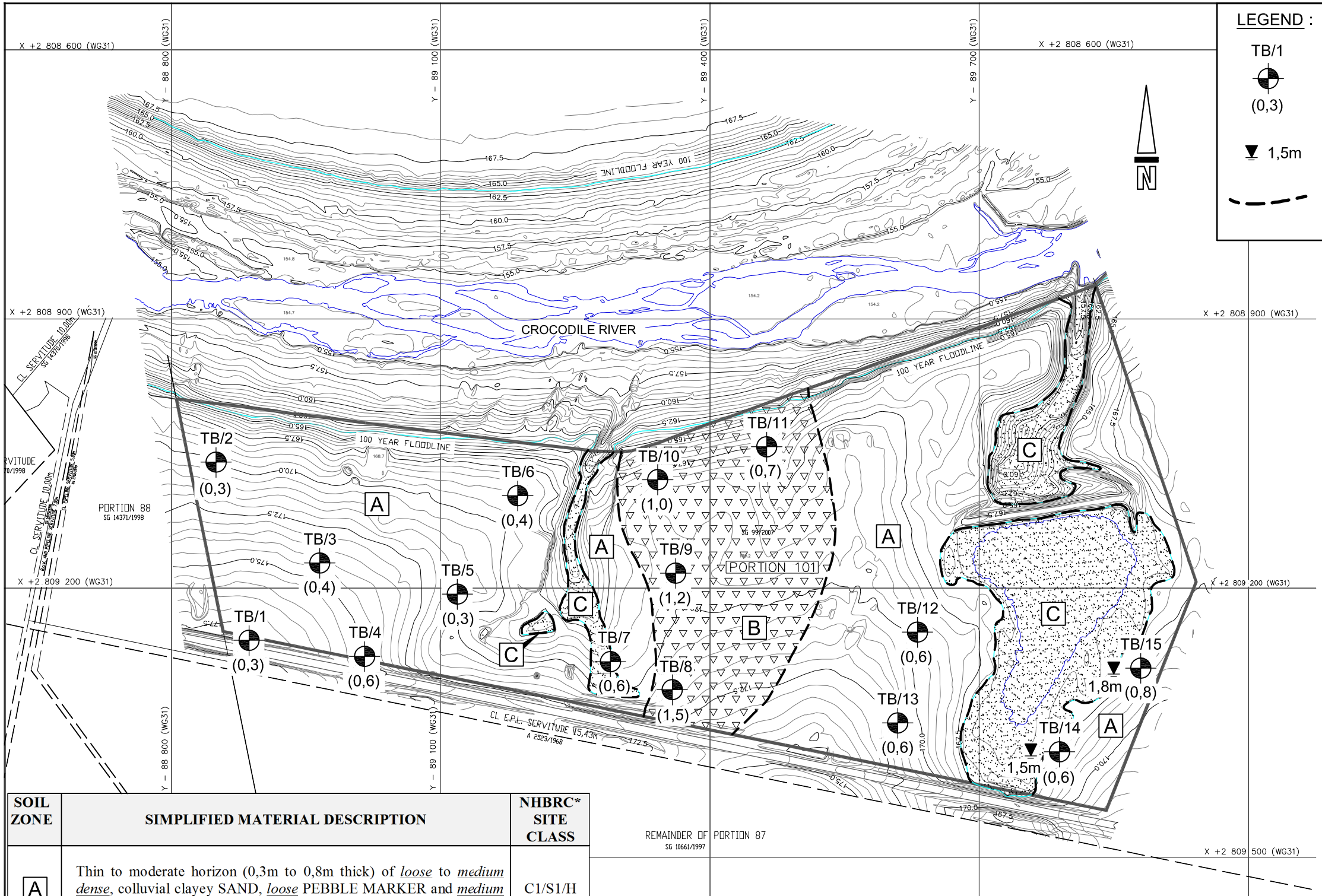
FAX : (012) 347 9064

TITLE / TITLE GEOTECHNICAL MAP	TEK / DRG NO M16/3572
LIGGING / LOCALITY PORTION 101, OF THE FARM TEN BOSCH 162 - JU	DATUM / DATE AUGUST 2016
KLIËNT / CLIENT DERICK PEACOCK ASSOCIATES	SKAAL / SCALE 1 : 5000 ON A3



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