



forestry, fisheries & the environment

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SPECIALIST DECLARATION FORM – AUGUST 2023

Specialist Declaration form for assessments undertaken for application for authorisation in terms of the National Environmental Management Act, Act No. 107 of 1998, as amended and the Environmental Impact Assessment (EIA) Regulations, 2014, as amended (the Regulations)

REPORT TITLE

Geotechnical Assessment Study for Panfontein _Rand Water

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1. SPECIALIST INFORMATION

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SPECIALIST DECLARATION FORM – AUGUST 2023

3. UNDERTAKING UNDER OATH/ AFFIRMATION

I, Limpho Phatela, swear under oath / affirm that all the information submitted or to be submitted for the purposes of this application is true and correct.

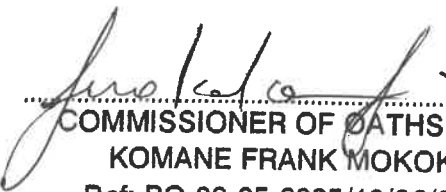

Signature of the Specialist



Phatela Geoconsulting
Name of Company

18 September 2025
Date

Click or tap here to enter text. 
Signature of the Commissioner of Oaths

Click or tap to enter a date. 2025 -09- 18
Date


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**GEOTECHNICAL INVESTIGATION
REPORT**

FOR

PANFONTEIN VARIOUS BUILDINGS

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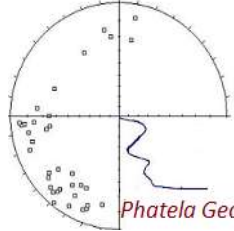

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**GEOTECHNICAL INVESTIGATION REPORT
FOR PANFONTEIN RAND WATER
GAUTENG PROVINCE**

**JULY 2023
FINAL**

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GEOTECHNICAL INVESTIGATION FOR PANFONTEIN RAND WATER, GAUTENG PROVINCE

CLIENT	:	IMPAPHALA PROJECTS & CONSULTING
PROJECT NAME	:	GEOTECHNICAL INVESTIGATION FOR PANFONTEIN RAND WATER
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Approval by Phatela Geoconsulting

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by

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Initials &
Surname



Signature

5-07-2023

Date

EXECUTIVE SUMMARY

Following the appointment by Impaphala Projects and Consulting, Phatela Geoconsulting carried out a geotechnical investigation for proposed structures, in Panfontein Rand Water. The area's coordinates in Longitude and Latitude, Datum WGS 84 are 26°42'21.1"S and 28°01'56.1"E respectively.

The geotechnical investigation was carried out in three stages; a desktop study, geotechnical profiling of test pits, percolation test and DCP tests as well as testing of soil samples at SANAS accredited laboratories.

Geologically, the site is underlain by a mantle of fill, aeolian and residual soils. The soil mantles are underlain by basalt rock of Kliprieversberg Group under Ventersdorp Supergroup.

Fluctuating EASBP values on site indicate that the ground strength has to be improved before placing a designed foundation type to tolerate potentially weak local spots.

Concrete, steel and fibre cement have to be protected from corrosive as well as highly aggressive soil that exists on site.

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1 INTRODUCTION

This report provides factual and interpretive details of geotechnical investigation carried out for several new structures to be constructed within Panfontein Rand Water facility. The purpose of the investigation was to explore the subsurface conditions in order to determine the characteristics of the soil and its expected behaviour upon loading.

The investigations started with a desktop study followed by fieldwork which entailed excavation of the test pits using a Tractor loader backhoe (TLB) machine; profiling of the test pits by an engineering geologist; retrieval of soil samples from the test pits so as to be tested at SANAS accredited laboratories as well as performing in-situ Dynamic Cone Penetrometer tests.

The report therefore, provides details of methods of the investigation, results obtained, geotechnical assessment, site characterisation as well as recommendations.

1.1 Terms of Reference

Phatela Geoconsulting was appointed by Impaphala Projects and Consulting in order to carry out geotechnical investigation work for various structures at Panfontein Rand Water. The structures that are to be constructed are three guardhouses, office building, recreational area and a weighbridge.

1.2 Scope of Work

The scope of work as agreed with the Client was as follows;

- Excavation of test pits to expose subsurface soil/rock conditions to a minimum depth of 1.5m. Test pits were profiled by an engineering geologist in accordance with Guidelines for Soil and Rock Logging in SA by ABA Brink and RMH Bruin, 2002. Excavation to be done on designated areas whereby it was deemed safe to do so without damaging buried services.
- Retrieving of soil samples from the test pits for testing at a SANAS accredited laboratory.
- Presentation of field data and laboratory data. This should include photos, profiles and laboratory test results.
- Analysis of results and production of the Geotechnical Investigation Report.

1.3 Available Information

- A general background of the project was communicated including a walk-over.

1.4 Limitations

- The main challenge was unknown presence of the buried services. Such challenge impeded excavation at some areas lest the interception of the buried of services.
- In addition, there were no drawings available at the time of the fieldwork therefore exact positions of the footprints were not established.

2 LOCALITY

This facility's main entrance coordinates in Longitude and Latitude, Datum WGS 84 are 26°42'21.1"S and 28°01'56.1"E respectively. To get to the main entrance of Panfontein Rand Water, one will have to drive along R54 Road for about 1.2km from the intersection with R42 Road. This will lead to another junction whereby R54 Road forms another intersection with a tar road leading further southward. Driving for about 5.4km along this road will lead to a left turn on to the gravel road. A 500m drive on the gravel road will lead to the main entrance. **Figure 1** illustrates the route mentioned above.

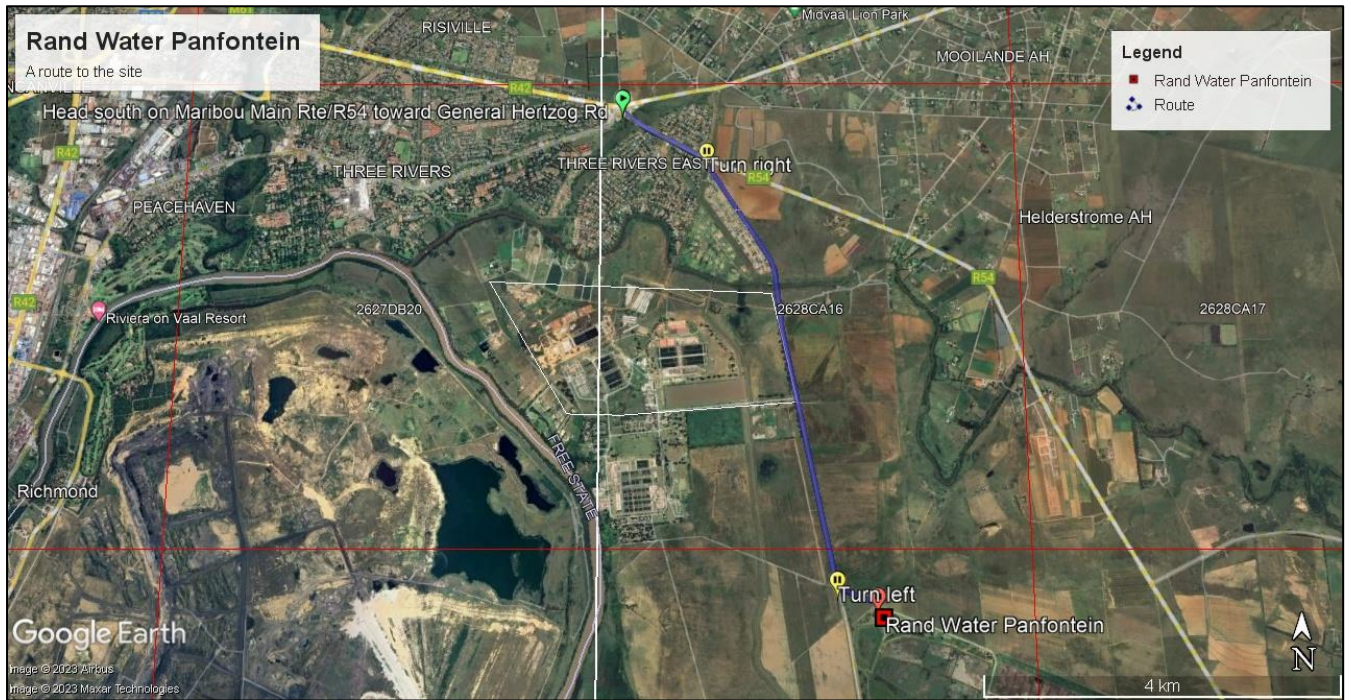


Figure 1 : Aerial view image of one of the routes to Panfontein Rand Water extracted from Google Earth

2.1 Site Description

The investigated area is a Rand Water sludge disposal facility with a well secured controlled access. The site is easily accessible on properly constructed roads. Within the establishment, there are several sites denoted, for the sake of reference in this report, as Guardhouse 1, Guardhouse 2, Office Building, Recreation Area and Weighbridge as shown on **Figure 2 below**. Each site will be described independently on the following sections.



Figure 2: Aerial view of various sites extracted from Google Earth

2.1.1 Guardhouse1 Site

Guardhouse1 will be constructed near the main entrance on the eastern side of the internal road. **Figure 3 below** shows aerial view of the site, extracted from Google Earth images.



Figure 3: Aerial view of the Guardhouse 1 extracted from Google Earth

2.1.2 Guardhouse 2 Site

Guardhouse 2 will be constructed near one of the entrances on the south-western side of the internal road. There are trees within a close proximity of the site where the guardhouse will be constructed.

Figure 4 below shows an aerial view of the site, extracted from Google Earth images.



Figure 4: Aerial view of Guardhouse 2 site extracted from Google Earth

2.1.3 Office Building Site

The Office Building site is situated on the south-western side from the current administration buildings. The site is an open space with to a currently utilised septic tank situated towards the north-western corner of the open space. **Figure 5 below** shows aerial view of the site, extracted from Google Earth images.

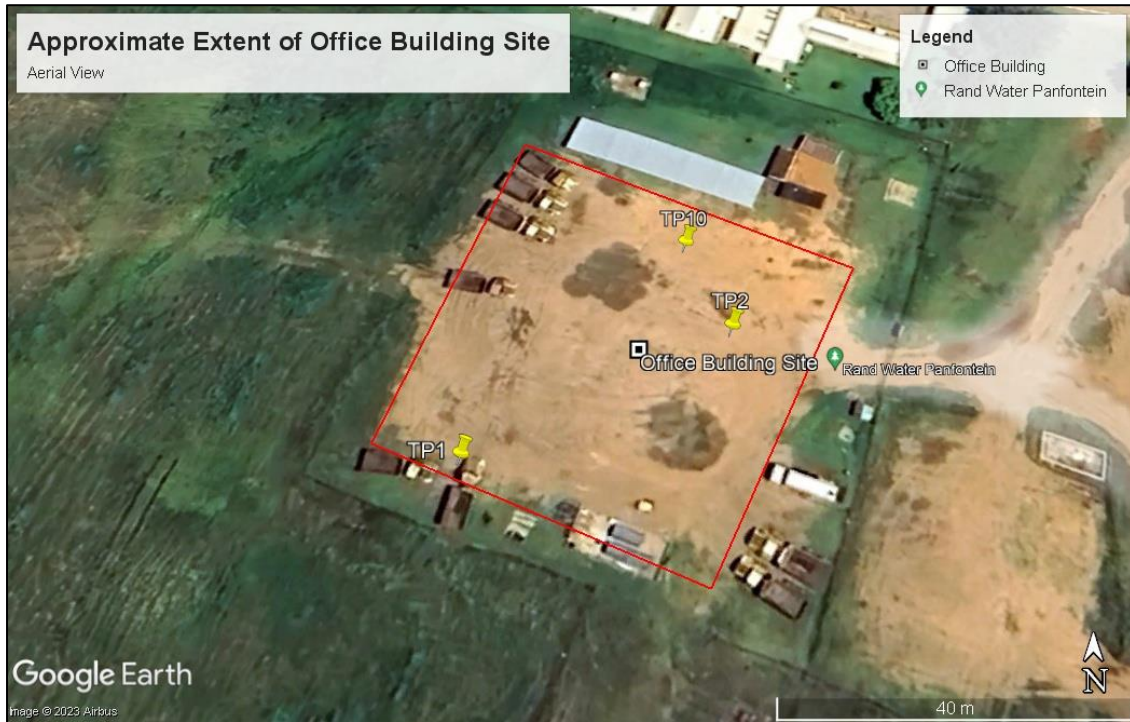


Figure 5: Aerial view of the Office Building site extracted from Google Earth

2.1.4 Recreational Area Site

This area will be constructed at an area with a significant tree density. At the time of the field work, there was a thatched roof structure within the site. **Figure 6 below** shows aerial view of the recreational area extracted from Google Earth images.



Figure 6: Aerial view of recreational area site extracted from Google Earth

2.1.5 Weighbridge Site

The existing weighbridge is dilapidated and what is left are ramps and ruins of a single-story building nearby. The site is adjacent to internal gravel road that heads towards Guardhouse 2. **Figure 7 below** shows an image of the Weighbridge site extracted from Google Earth.



Figure 7: Aerial view of the weighbridge site extracted from Google Earth

2.2 Natural Physical Features

There were neither land subsidence or slip zones identified on site during the field investigation.

3 METHODS OF INVESTIGATION

The geotechnical study was carried out in three phases; **desktop study**, **fieldwork** which comprised of excavation and profiling of test pits, dynamic cone penetration (DCP) tests as well as a percolation test. The third phase was **laboratory testing** of soil samples. Desktop study, fieldwork and report writing were all done by an Engineering Geologist with **Pr Sci Nat** qualifications. The details of each stage are explained below.

3.1 Desktop Study

The desktop study comprised of studying of geological maps to confirm the anticipated geology and geotechnical properties of the soils. This information was used to provide guidance on appropriate soil tests to be performed. The desktop study also includes the location of the study area using Google

Earth in order to get an appreciation of the site and to prepare accordingly for the investigations, as well as studying of topographical and any other available information.

3.2 Test Pits Excavation

Ten test pits, designated TP1 through TP10 were excavated aimed to minimum depth of about 1.5m depth unless if refusal and/or pit collapse occurred, in order to investigate subsurface soil conditions. The subsurface investigation focused on the moisture, colour, consistency, soil structures, soil type and origin of the soil. In the case of bedrock, the focus was mainly be on colour, weathering, existing structures, rock hardness, type of rock and its origin.

The positions of the test pits were recorded using a Garmin GPS handset and are pinned on the Google Earth images on **Figures 2 to 7 above**. Test pits were profiled by an engineering geologist and their profiles along with the respective pictures are included in **Appendix A** of this report.

3.3 Dynamic Cone Penetration Tests

Five Dynamic Cone Penetration (DCP) tests, designated DCP1 through DCP5, were carried out at the positions shown on **Table 1 below**. The DCP tests were aimed to advance to minimum depth of 1.5 metre below existing ground level unless where refusal occurred. The results of the DCP tests, comprising plots of blow counts per 100mm advance and estimated safe allowable bearing capacity values against depth, are given in **APPENDIX B**.

Table 1: List of DCP points with their respective positions and depths

DCP No.	Coordinates		Advanced depth(m)	Refusal (m)
	Longitude	Latitude		
DCP 1	26°06'50.2"S	28°13'52.4"E	1.50	None
DCP 2	26°06'50.2"S	28°13'53.9"E	1.50	None
DCP 3	26°04'57.0"S	28°13'52.5"E	1.50	None
DCP 4	26°06'51.0"S	28°13'50.9"E	1.50	None
DCP 5	26°06'49.5"S	28°13'52.9"E	1.00	None

3.4 Laboratory Testing

Disturbed bulk soil was sampled by the engineering geologist and sent to SANAS accredited laboratories for testing.

The following laboratory tests were conducted on representative samples from site:

- Foundation Indicators; Particle Size distribution and Atterberg Limits
- Moisture content
- Mod AASHTO moisture/density relationship and CBR
- Electric Conductivity
- pH
- Basson Index

4 INVESTIGATIONS RESULTS

4.1 Topography

The sites are situated on a gently sloping terrain towards either north-western or south western direction. **Figure 8 below** shows a scaled topography locality map for the facility extracted from 2628CA Meyerton. The widely spread contour lines illustrate the gentleness of the terrain.

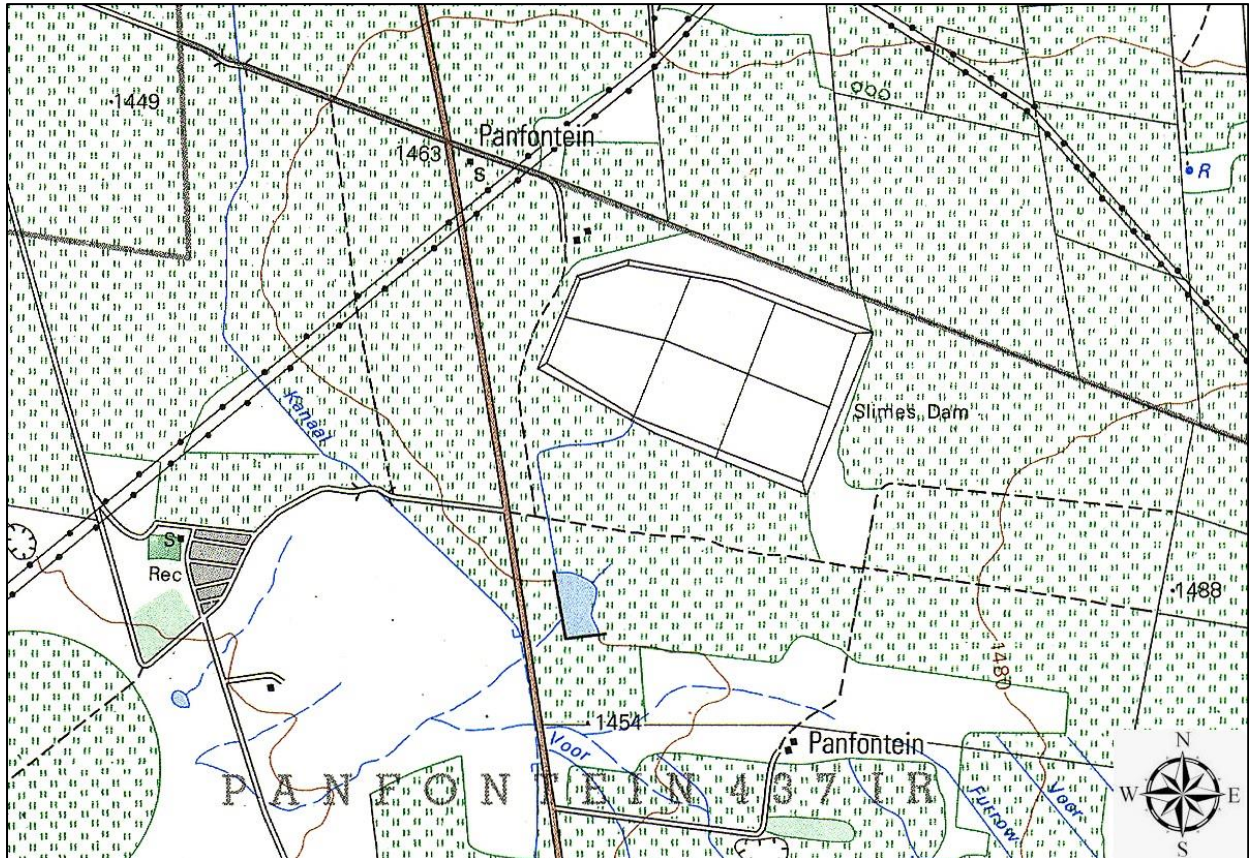


Figure 8 : An extract of topography locality map where Panfontein Rand Water is situated

In addition, **Figure 9 below** shows elevation levels of the areas at and around the Panfontein Rand Water facility. From the figure below, it can be seen that the maximum elevation of the site is about 1,477m asl and the minimum elevation is about 1,463m asl towards the south-western and north western sides.



Figure 9 : Different elevation levels displayed at and around the Panfontein Rand Water facility

4.2 Climate

Simulated historical climate and weather data report compiled by Meteoblue, indicate that this area receives the minimal rainfall (2mm) in July and the highest (111mm) in December. It is reported that, the average daily maximum temperatures at Panfontein Rand Water ranges between 18°C in June and 29°C in January. This area is coldest during the month of July whereby a minimum temperature of -3°C on average during the night may be experienced. The highest wind speed of about 23km/h may be anticipated between the months of September and November. **Figure 10 below** shows graphs of average temperatures, wind speed and rainfall at facility.

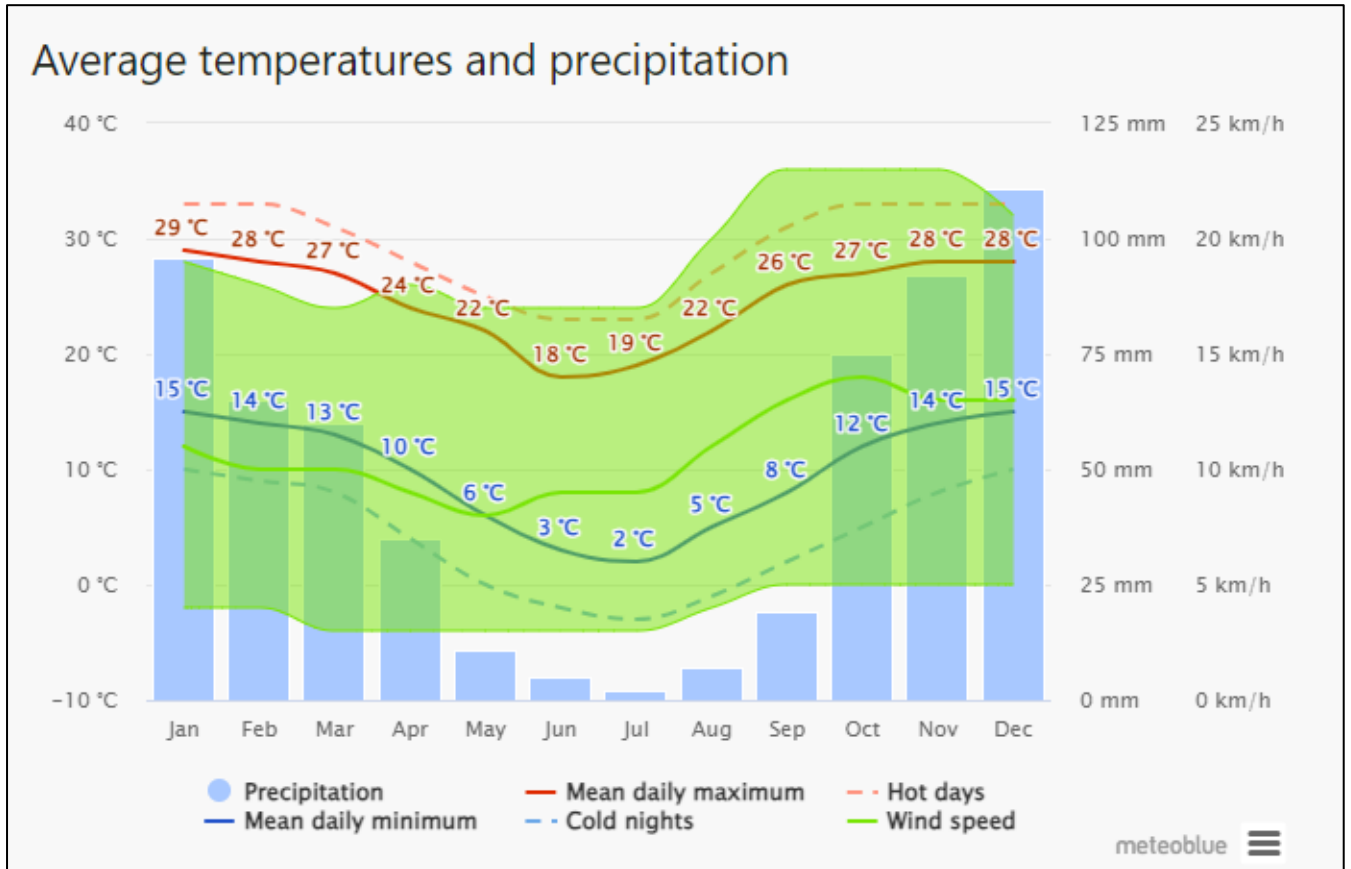


Figure 10: Various graphs illustrating average temperatures, rainfall and wind speeds at Panfontein Rand Water

4.3 Geology

The Geological Map Series, sheet number 2628 East Rand, published at a scale of 1:250 000 by Council for Geosciences indicate that the sites are situated on the area that is covered with a mantle of aeolian sand of which, at some places, is underlain by basalt rock of Kliprievsberg Group under Ventersdorp Supergroup. **Figure 11 below** shows a scaled geological map of the area where the sites are situated extracted from 2628 East Rand Geological Map and generated using Google Earth.



Figure 11: Regional geology of the area where the sites are situated extracted from 2628 East Rand Geological Map

4.4 Local Geology

On excavation of the ten test pits, the sites were observed to be underlain by a mantle of a fill, aeolian sand, residual soil and basalt bedrock. **Table 2 below** shows a summary of test pits logs whereby **Appendix A** shows full details of the logs and respective photographs.

Table 2: Summary of the test pits logs

Test Pit No.	Co-ordinates		Test Pit Depth (m)	Fill Depth (m)	Aeolian sand Depth (m)	Residual soil Depth (m)	Basalt bedrock Depth (m)	Sample Retrieved Depth (m)	Sidewall Collapse Depth (m)	GWS Depth (m)
	Longitude	Latitude								
TP 1	26°43'07.2"S	28°02'28.5"E	2.80	0.0-0.20	0.2-1.20	0.2-1.20	None	None	None	None
TP 2	26°43'06.6"S	28°02'29.8"E	2.60	0.0-0.10	0.1-0.60	0.6-2.60	None	0.6-2.60	None	None
TP 3	26°43'09.6"S	28°02'32.9"E	1.60	None	0.0-0.90	1.0-1.60	None	0.0-0.90	0.0-0.90	None
TP 4	26°43'09.7"S	28°02'34.2"E	1.60	None	0.0-0.80	0.8-1.60	None	None	0.0-0.80	None
TP 5	26°43'17.20"S	28°02'34.6"E	2.80	None	0.0-0.80	0.8-2.80	None	0.8-2.80	None	2.80
TP 6	26°43'17.90"S	28°2'33.10"E	2.70	None	0.0-0.70	0.7-2.70	None	0.0-0.70	None	None
TP 7	26°43'05.3"S	28°01'51.6"E	2.60	None	0.0-1.10	1.1-2.30	2.3-2.60	0.0-1.10	None	None
TP 8	26°43'05.6"S	28°01'52.3"E	2.80	None	0.0-0.90	0.9-2.60	2.6-2.80	None	None	None
TP 9	26°42'21.1"S	28°01'56.1"E	2.70	0.0-0.30	0.3-0.80	0.8-2.70	None	0.8-2.70	None	2.70
TP 10	26°43'06.6"S	28°02'29.8"E	1.50	0.0-0.10	0.1-1.20	1.2-1.50	None	None	None	None

*GWS=Groundwater seepage

4.4.1 Fill

Fill is a soil material transported mainly by human activity. This soil mantle was identified at some of the test pits. To be specific, the fill material was identified at the Office Building and Guardhouse1 sites. Such fill materials were underlain by aeolian sand. The fill at the **Office Building site** generally comprised of slightly moist, yellowish brown speckled dark gray, loose to medium dense, intact silty sand with subangular cobbles. On the other hand, the **Guardhouse1 site** fill material comprised of slightly moist, reddish brown speckled gray, medium dense, intact, slightly clayey coarse sand. At the former site, fill material was identified at depths of between 0.1 and 0.2m below ground level with average thickness of 1.3m while at the latter site, it was identified to the depth of about 0.3m below ground level.

4.4.2 Aeolian Sand

Aeolian sand is a soil mantle that is naturally deposited by wind. This soil mantle was found on all test pits forming either an uppermost soil horizon or overlain by fill material. This soil horizon generally comprised of slightly moist, dark gray, yellowish brown or dark brown, loose to medium dense, intact very fine silty sand. This fine silty sand was identified at depths of between 0.1m and 1.2m with average thickness of about 0.9m at the **Office Building site**.

At the **Recreational Area site**, this soil type existed from surface to depths of between 0.8m and 0.9m below ground level with average thickness of about 0.9m. It is on this site that the sand showed a yellowish-brown speckled orange colour.

At the **Weighbridge site**, the aeolian sand showed a light gray stained dark brown colour. It was observed from surface to depths of between 0.7m and 0.8m below ground level with average thickness of about 0.8m.

The aeolian sand at the **Guardhouse 2 site** showed the same colour as the one at the Weighbridge site although the depths were identified from surface to depths of between 0.9m and 1.1m below ground level with an average thickness of about 1.0m.

A reddish brown speckled gray aeolian sand was identified at **Guardhouse 1 site** at depths of between 0.3 and 0.8m below ground level.

4.4.3 Pebble Marker

This is a gravelly soil horizon that sometimes forms a boundary between transported soil and residual soil. This soil horizon was only identified in one test pit at recreational area. It generally comprised of slightly moist, yellowish brown speckled gray, medium dense to dense, intact sandy gravel with subrounded pebbles. The thickness of this pebble marker was about 0.1m as it was identified at depths of between 0.9m and 1.0m below ground level.

4.4.4 Residual Soil

Residual soil is such soil that is directly derived from a complete weathering of the underlying bedrock. On this particular site, the existing residual soil is a result of a complete weathering of the underlying basalt bedrock.

The residual soil was observed at depths of between 0.6 and 2.8m below surface with average thickness of about 1.0m. This soil mantle generally comprised of slightly moist, light gray stained orangey brown, speckled black, medium dense to dense, fissured clayey sand.

At the **Office Building site**, this soil was identified at depths of between 0.6m and 2.8m below ground level with thickness of at least about 0.9m.

The same soil horizon was observed at depths of between 0.7m and 2.8m below ground level at the **Weighbridge site**. A thickness of at least 2.0m may be anticipated on this site.

At the **Guardhouse 2 site**, the residual soil was exposed at depths of between 0.9m and 2.6m below ground level with average thickness of about 1.2m. On the other side, **Guardhouse1 site**, had this clay at extended depth of about 2.7m from 0.8m below surface.

At the **Recreational Area**, a very dense clayey sand that led to refusal of the TLB, was identified at depths of between 0.8m and 1.6m below ground level with average thickness of at least 0.7m. The TLB refused at depth of 1.6m below ground level in both test pits.

4.4.5 Basalt bedrock

The bedrock was only identified at **Guardhouse2 site** at depths of between 2.3m and 2.8m below ground level. The bedrock was generally identified as greenish gray stained orangey brown, moderately to highly weathered, very closely fractured, soft to medium hard basalt rock of Klipriviersberg Group.

4.5 Seismicity

The seismic hazard map of South Africa (Kijko, et. al., 2003) was consulted in order to obtain the peak ground acceleration of the area of interest. According to the published seismic hazard map of South Africa (Kijko, et. al. 2003), the peak ground acceleration at the area where Panfontein Rand Water is situated, with 10% probability of exceedance in 50years, ranges between 0.16g and 0.18g as shown on **Figure 12 below**. This range may be considered as medium in terms of Seismic Hazard Level.

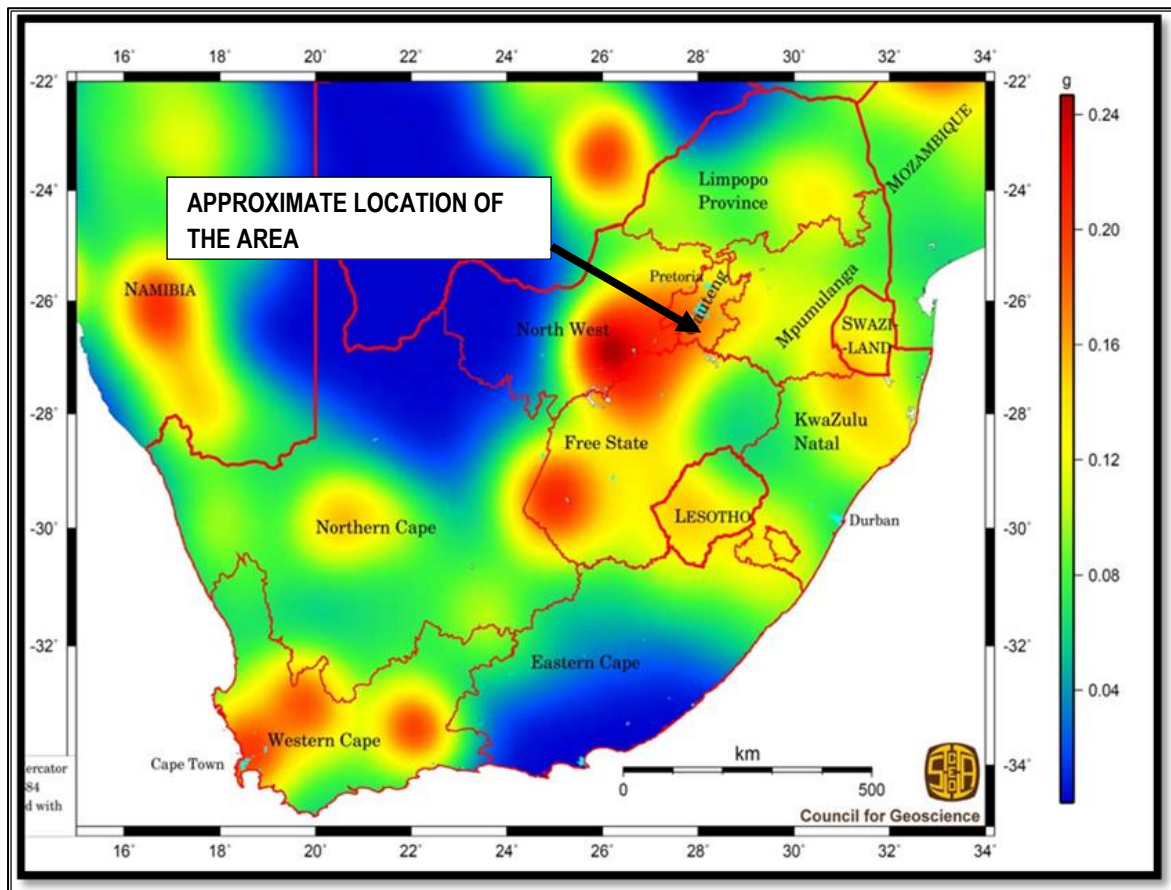


Figure 12: Seismic Hazard Level map of parts of Southern Africa

4.5.1 Mercalli Scale

According to seismic hazard map derived from United Nations Office for the Coordination of Humanitarian affairs (OCHA), particularly the seismic intensity map, Randfontein Rand Water is generally located in Class VI area using Mercalli Scale. **Figure 13 below** shows a map of different seismic intensity across parts of Africa extracted from OCHA report.

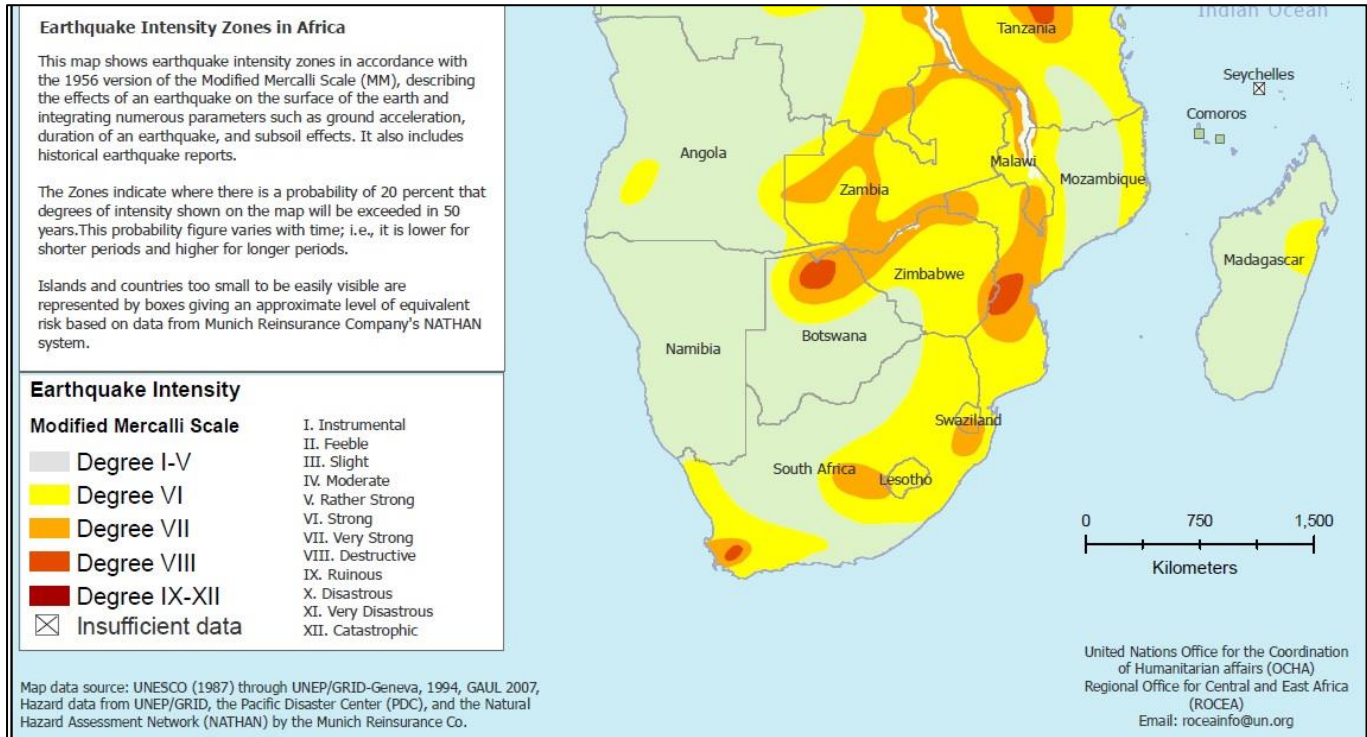


Figure 13: Seismic Intensity map of parts of Southern Africa

The Mercalli Scale is used to measure the intensity of an earthquake and its effects on people and structures. A level VI on Mercalli Scale categorises the impact of the seismic event as strong. **Table 3 below** shows varying classifications of Mercalli Scale intensities.

Table 3: Modified Mercalli scale intensities

I. Not felt	Not felt except by a very few under especially favourable conditions.
II. Weak	Felt only by a few persons at rest, especially on upper floors of buildings.
III. Weak	Felt quite noticeably by persons indoors, especially on upper floors of buildings. Many people do not recognize it as an earthquake. Standing motor cars may rock slightly. Vibrations similar to the passing of a truck. Duration estimated.
IV. Light	Felt indoors by many, outdoors by few during the day. At night, some awakened. Dishes, windows, doors disturbed; walls make cracking sound. Sensation like heavy truck striking building. Standing motor cars rocked noticeably.
V. Moderate	Felt by nearly everyone; many awakened. Some dishes, windows broken. Unstable objects overturned. Pendulum clocks may stop.
VI. Strong	Felt by all, many frightened. Some heavy furniture moved; a few instances of fallen plaster. Damage slight.
VII. Very Strong	Damage negligible in buildings of good design and construction; slight to moderate in well-built ordinary structures; considerable damage in poorly built or badly designed structures; some chimneys broken.
VIII. Severe	Damage slight in specially designed structures; considerable damage in ordinary substantial buildings with partial collapse. Damage great in poorly built structures. Fall of chimneys, factory stacks, columns, monuments, walls. Heavy furniture overturned.

4.6 Laboratory Test Results

Laboratory tests results are detailed in **Appendix C** and summarised in **Table 4** below.

Table 4: Summary of laboratory test results

Descriptions	TP2	TP3	TP5	TP6	TP7	TP9	TP10
	0.6-2.60m	0.0-0.90m	0.8-2.80m	0.0-0.70m	0.0-1.10m	0.8-2.70m	0.0-1.20m
Gravel (%)	16	0	15	-	5	33	1
Sand (%)	49	89	54	-	75	44	80
Silt (%)	7	6	7	-	11	7	10
Clay (%)	28	5	24	-	9	16	9
Liquid Limit (%)	34	-	32	-	-	25	-
Plasticity Index (%)	9	NP	12	-	NP	6	NP
Linear Shrinkage (%)	4.0	0.0	4.0	-	0.0	3.0	0.0
Heave Potential	Low	Low	Low	-	Low	Low	Low
pH	7.45	5.62	6.0	7.7	7.56	7.06	4.72
EC (Siemens/m)	0.0097	0.0259	0.0104	0.0165	0.0086	0.0108	0.0346
Electric Resistivity $\Omega \cdot m$ (calculated)	103.1	38.6	96.2	60.6	116.3	92.6	28.9
Collapse Potential %	5.7	-	2.5	-	-	-	-
PRA Classification	A-4-0	A-2-4	A-2-6	A-2-6	A-2-4	A-2-4(0)	A-2-4(0)
Unified Soil Classification	SM	SM	SC	SC	SM	SM & SC	SM
Colto Classification	>G9	-	>G9	-	-	-	-
Max. Dry Density (kg/m ³)	1834	-	1841	-	-	-	-
Optimum Moisture (%)	14.5	-	12.6	-	-	-	-
100% Mod AASHTO	3	-	2	-	-	-	-
98% Mod AASHTO	2	-	2	-	-	-	-
97% Mod AASHTO	2	-	2	-	-	-	-
95% Mod AASHTO	2	-	1	-	-	-	-
93% Mod AASHTO	1	-	1	-	-	-	-
90% Mod AASHTO	1	-	1	-	-	-	-

5 GEOTECHNICAL ASSESSMENT

5.1 Groundwater

Groundwater seepage was only observed in TP9 at the **Guardhouse1 site** as well as in **TP5** at the **Weighbridge site**. The groundwater seepage was identified at depths of 2.70m and 2.80m respectively. It must however be stated that, during periods of prolonged rainfall, particularly during the summer season, a marked increase in the occurrence and magnitude of groundwater seepage flow may be anticipated.

5.2 Potential Sinkhole/ Doline Formation

The geological map shown on **Figure 11 above** illustrate that there is no dolomite where the sites are situated. It is therefore not expected that the sites can be prone to dolines and/or sinkholes formation.

5.3 Excavatability

Based on the test pits, excavation conditions may be anticipated as 'soft mechanical excavation' according to SANS 1200D "Classification of material for machine excavation" to depths of at least 1.5m at all the sites.

5.4 Construction Materials Classification

The laboratory test results indicated that the aeolian sand and residual soil had a PRA classification of ranging from A-2-4 to A-4-0 showing as good to fair quality of subgrade. Compaction test that was done on residual soil also showed a classification that is poorer than G9 quality according to Colto Classification and thus affirming that the material may be considered as fair subgrade quality.

5.4.1 Nearby Commercial Source

The only nearby commercial source that was identified was **Afrimat - Glen Douglas Dolomite Mine**. It is a mine that is located about 30km from Panfontein Rand Water. The place is basically selling varying sizes of aggregates including G5 quality material.

5.1 Collapse Potential

Collapsible soils are ones that have their soil grains weakly bonded. This factor implies that the volume and structure of the soil can change within a short space of time. The sudden change in volume and structure weakens the strength of the soil and thus deteriorates the stability of the buildings.

Normally, the soil is tested in the laboratory to assess its collapse potential. Jennings and Knight (1975) did extensive studies to correlate the collapse potential with the degree of severity to the structure. The collapse potential results of the soil at the site reveal that the residual soil has a collapse potential ranging between 2.5% and 5.7%. With this range, this tells that the soil mantle has a potential of being problematic in terms of its collapse severity. Aeolian sands have clay content way lower than any of the residual samples. It is therefore expected that such sands to even have higher potential of collapsibility due to weaker bonds.

5.2 Percolation Test

Percolation test is a method that is normally used to test if the soil would be properly suitable for soak-away systems. A depth at which the percolation test was conducted was informed by the communication with the project's civil engineer stating that the invert depth will be anticipated to be at 1.5 below ground level. The results on **Table 5 below** show that the percolation test failed and therefore soak-away system would not be ideal on the ground on site. The clay content does not allow percolation of the water at a desired speed. It is important to state that such residual clayey sand was consistent throughout the site and therefore there was no need to continue at other areas with the test. As a matter

of fact, the percolation test was left for more than 4 hours and during that period, only 2mm change of level was observed.

Table 5: Percolation Tests results

Time (minutes)	Drop in Water Level in Test Hole (mm)
0	300
5	298
10	298
15	298
20	298
25	298
30	298
35	298
Depth of percolation test (metres below existing ground level)	1.2 – 1.5
Percolation rate. Time for a 25mm fall in test water level (minutes)	>40
Result of Test	Fail
Rate of application of effluent to subsoils in ℓ/m ² soakpit wall area/day	N/A

5.3 Bedding Material

In terms of the SANS 1200 LB (1983) concerning bedding requirements, buried pipelines require two types of selected material. Those selected materials are termed “Selected Granular Material” and “Selected Fill Material”.

In general, the “Selected Granular Material” is used as bedding material to support the pipes, while the “Selected Back Fill Material” is used as blanket material over the crown of the pipe. General Backfill material is placed above the blanket materials, up to ground level.

From visual inspection and laboratory test results, the following comments and recommendations regarding the suitability and use of these materials are as follows.

- **None** of the insitu materials sampled meet the grading requirements for “Selected Granular Material” laid down in SABS 1200 LB (1983). Selected granular material is defined as “*granular, non-cohesive and singularly graded between 0.6mm and 19mm. The material must be free draining and have a compactability factor not exceeding 0.4*”. Therefore, all selected granular bedding material will need to be **imported** to the site.
- If carefully sorted, the aeolian sand has a potential of being suitable for “Selected Fill” purposes. Selected fill is defined as “*a material with a Plasticity Index (PI) not exceeding 6, free from lumps, vegetation and stones of a diameter exceeding 30mm*”.

The other soil horizon excavated from trenches may be used as general backfill over the selected layers.

5.4 Stability of Trenches

There was evidence of sidewall collapse of aeolian sand at the **Recreational Area**, upon the test pits being left open for a period of about half an hour. Furthermore, the event whereby water ingress is encountered, or the trenches are left open for an extended period, there is a higher chance of instability problems due to pore water pressure. In such case(s), the excavated trenches will therefore have to be shored at all times to avoid sidewall collapse.

5.4.1 Precautionary Measures

5.4.1.1 BEDDING

- Bedding material for pipe placement shall not be a frost susceptible material
- Before placing any bedding material, the bottom of the trench shall be hand raked ahead of the pipe laying operation to remove stones and lumps which will interfere with smooth and complete bedding of the pipe.
- The specified bedding material shall then be placed in layer(s) the full width of the trench, each layer not exceeding eight inches in thickness loose measure, and compacted to 95% of maximum density as determined by AASHTO T 180 D, until the elevation of the plan grade for the pipe invert is attained.
- After the pipe has been laid and approved for covering, the specified bedding material shall be placed evenly on both sides of the pipe for the full width of the trench.

5.4.1.2 TRENCH SAFETY

It is important to ensure that soil removed from the trench is placed no closer than at least 2.0m from the edge of the trench. It is generally required that trenches deeper than 1.5m be adequately shored where there is a possibility of collapse. With pipeline trenches in particular, there is a tendency to open

the trench over large lengths thereby increasing the risk of sidewall collapse. In any event there must be provision for safe access not more than every 50m along the trench length.

Key issues regarding the stability of trench sidewalls are;-

- Soft wet soil conditions
- Surcharge loading at edges of trenches
- Groundwater seepage
- Rainwater runoff

Of these, both surcharge loading and control of rainwater runoff can be managed. Surcharge in the form of stockpiling of backfill, or trenching machinery (pipe laying rigs), must be placed well away from the edge of the trench.

5.4.1.3 BACKFILL AND EROSION

The trench line can also become a route for continued erosive activity, and with time could develop into a donga feature with resultant failure of the pipeline. It is therefore important to vegetate the trench outline as soon as possible after a process of backfilling is complete.

5.5 Bearing Capacity

Dynamic Cone Penetration can assist in determining the estimated allowable safe bearing pressures (EASBP) of the soils. **Appendix B** shows that the EASBP values range between as high as 240kPa but decrease to as low as between 54kPa and 31kPa at 1.5m depth. It was only at a Recreational Area site whereby the EASBP increased on a very dense clayey sand to 600kPa at 1.0m below ground level. The decrease in EASBP will require a foundation that will accommodate weak areas that have low EASBP values. The high consistency of the clayey sand at the **Recreational Area site** may be mostly influenced by a relatively dry conditions compared to other sites. Introduction of the moisture content on the clayey sand may similarly reduce the EASBP to levels that were observed at other four sites.

5.6 Soil Corrosivity

pH and electric conductivity contribute to the soil in having a corrosive effect. In general, the higher the acidity and the electric conductivity of the soil, the higher is its corrosiveness. The rating of the acidity or alkalinity of the soil sample is based on **Table 6 below**.

Table 6: Various ranges of pH and ratings

pH Range	Ratings
<4.5	Extremely acidic
4.5-5.0	Very strongly acidic
5.1-5.5	Strongly acidic
5.6-6.0	Medium acidic
6.1-6.5	Slightly acidic
6.6-7.3	Neutral
7.4-7.8	Mildly alkaline
7.9-8.4	Moderately alkaline
8.5-9.0	Strongly alkaline
>9.0	Very strongly alkaline

The results from the laboratory show that the soil samples at Panfontein Rand Water, had a pH ranging between 4.72 and 7.7 with electric conductivity ranging between 0.0104 and 0.0346S/m as previously shown on **Table 4 above**. The degree of the corrosiveness of the soil samples at various soil horizon, using pH, electric conductivity and electric resistivity, are listed on **Table 7** and **Table 8 below**.

Table 7: Corrosiveness of aeolian sands

TP	Depth	Description	Conductivity(S/m)	Electric Resistance $\Omega \cdot m$	Corrosiveness	pH	Degree of Acidity
TP3	0.0-0.90	Silty sand	0.0259	38.6	Highly	5.62	Moderately acidic
TP6	0.0-0.90	Silty sand	0.0104	60.60	Moderately	7.7	Slightly alkaline
TP7	0.0-1.10	Silty sand	0.0086	116.3	Mildly	7.56	Slightly alkaline
TP10	0.0-1.20	Silty sand	0.0346	28.9	Highly	4.72	Strongly acidic

Table 8: Corrosiveness of residual soil

TP	Depth	Description	Conductivity(S/m)	Electric Resistance $\Omega \cdot m$	Corrosiveness	pH	Degree of Acidity
TP2	0.6-2.60	Clayey sand	0.0097	103.1	Mildly	7.45	Moderately acidic
TP5	0.8-2.80	Clayey sand	0.0165	96.20	Moderately	6.0	Slightly alkaline
TP9	0.8-2.70	Clayey sand	0.0108	92.6	Moderately	7.06	Slightly alkaline

The two tables above show that the environment at the aeolian soil horizon has corrosiveness ranging from mild to highly corrosive. On the other hand, the residual soil degree of corrosiveness ranges from mild to moderately corrosive. It is therefore recommended that a specialist opinion be acquired as to how to protect the buried steel elements from the corrosive aeolian and/or residual soil horizons.

5.7 Basson Index Test

The aim of the test is to analyse the soil so as to determine the aggressiveness of the soil towards the concrete and fibre cement pipes. Basson Index tests results detailed on **Appendix C** and

summarised on **Table 9 below** indicate that both aeolian and residual soils have Aggressive Index (**N_c**) values of 1109 and 2546 respectively.

Table 9: Basson Index results and the related degree of aggressiveness

TP	Depth	Description	Origin	Basson Index	Aggressive Index N _c	Degree of Aggressiveness
TP5	0.8-2.80	Clayey sand	Residual soil	Aggressive	2546	Very highly
TP6	0.0-0.90	Clayey sand	Aeolian	Aggressive	1109	Very highly

Using the guidelines shown on **Table 10 below**, it can be concluded that the soil on site is highly aggressive to the concrete and fibre cement pipes. A specialist advice will also be needed to determine a suitable protection of concrete and fibre cement pipes from such highly aggressive soil environment.

Table 10: Guidelines for assessing overall aggressiveness (N_c)

N _c	Aggressiveness
Not greater than 300	None to mild
400-700	Mild to Moderate
800-1000	High
=or>1100	Very high

5.8 Soil Expansivity

Expansive soil is the one that has clay with a high smectite mineral content. This mineral has ability to absorb a high volume of water which in turn will result in overall swelling of the soil. The swelling of soil is known as heave. When the moisture decreases, the soil will also decrease in volume and thus shrink. Structures that are constructed on expansive clays are destabilised by the heave movement. For this reason, the soil is normally taken to the laboratory to analyse its expansivity potential. Results from the laboratory indicate that the soil on site has low heave potential.

Van Der Merwe¹, 1975, compiled a relationship of Expansive Potential of clay to heave movement and according to such relationship; no heave movement may be anticipated throughout the site.

Geotechnical Classification

In terms of Geotechnical Classification of Urban Development, after Patridge, Wood and Brink, the area may be categorised as **Intermediate Favourable Class**. This class was selected based on the parameters discussed above and summarised on **Table 11 below**. **Intermediate Class** category means precautionary measures are to be taken as prescribed during design and construction.

¹ D.H Van Der Merwe (1964) The Prediction of Heave from the Plasticity Index and Percentage Clay Fraction of Soils. The Civil Engineer, pp103-107

Table 11: Geotechnical Classification Parameters

Geotechnical Classification for Panfontein Rand Water	
Geotechnical Constraint	
Collapsible Soil	Problematic
General Description of the site	Urban in nature
	Aeolian sand underlain by residual basalt that comprises of clayey sand
	No rock outcrop encountered on site
	Developed area with different services
	Relatively dry to slightly moist area
Groundwater Seepage and runoff	Permanent or perched water more than 1.5m below ground surface
Potential Expansiveness	Low
Compressible soil	Highly to moderately compressive
Erodibility of the soil	Moderately to high on aeolian sands
Difficulty of excavation to 1.5m depth	Soft excavation is anticipated throughout the site to 1.5m with a TLB machine
Drainage route	Storm water may generally be channelled via designed stormwater system
Stability (Dolomitic/limestone presence)	No dolomitic risk
Slope Classification	Gentle slope; angle between 2 and 6 degrees
Seismicity	10% Probability of seismic activity less than 100cm/sec ² within 50 years
Need for specialised Floodline Investigation	No existing water course observed in the vicinity of this site.

5.9 Site Class Designation

It is understood that the guardhouses and recreational building will be single storey structures while the office building may be either single or double-storey structure. It is recommended that structures be founded on foundations, such as a stiffened or cellular raft, that can tolerate differential settlements due potentially compressible and collapsible soils. It is not known what type of structures are to be constructed for the weighbridge, however, consolidation tests have also been conducted on the clayey sands for the Structural Engineer to determine **m_v** as well **S_c** for design purposes.

The following is recommended:

- All foundations should be designed by a Structural Engineer.
- If the strength of the ground is to be improved, such improvement must be designed by the structural engineer.

Under no circumstances should the foundations be placed in fill, unless such fill is engineered for such purpose. Buildings should be positioned in the cut part of platforms to avoid founding in fill and to minimise founding costs.

In addition to the above, the following good building practice is recommended to minimise differential movements beneath foundations:

- Buildings should have a concrete surround, minimum width 1 metre, with falls away from the building to ensure drainage of stormwater away from the structure. This will prevent the ingress of water into the foundation soils.
- All roof water is to be collected via down pipes and discharged away and downslope of the building.
- No flower beds or vegetation to be planted within 3 metres of any structure.
- Septic tanks and soak pits, if present, must not be located within 3 metres of the structure, downslope from structures

It is recommended that an experienced engineering geologist must inspect and approve all foundations excavations to confirm the conditions of the excavations.

6 PRECAUTIONERY MEASURES

6.1 Drainage

The most important factor in the promotion of a stable site is the control and removal of both surface and groundwater from the site. It is important that the design of the stormwater management system allows for the drainage of accumulated surface water. Such water should be directed towards the natural drainage lines. Disposal of stormwater should in any case conform to the Local Authority's requirements. Points of discharge of piped stormwater should be carefully designed to limit erosion.

6.1.1 Surface Drainage

Surface drainage of building platforms should be designed to direct water away from fill edges to prevent overtopping of the fill crest and erosion of the fill embankment slopes. It is important that grassing of fill embankments be carried out as soon as possible after construction.

6.1.2 Sub-surface Drainage

The need for subsoil drains will have to be assessed on site during development. Where groundwater seepage is encountered during construction, these zones will need to be controlled with effective subsoil drains, particularly where water is likely to gain ingress into the structural layers of foundations. The occurrence of seepage at the base of the platforms cuts may also require similar treatment.

6.2 Vegetation

All trees should be regarded as potential source of damage to any housing developments. The following varieties are, however, particularly prone to causing damage:

- a) All eucalyptus varieties;
- b) Lombardy (Free State) poplars;
- c) London planes;
- d) Willows (Salix) of any type; and
- e) Jacarandas.

The greatest risk of direct damage occurs close to the tree from the growth of the main trunk and roots, and diminishes rapidly with distance. The risk of damage can be minimized should precautions be taken when the distance from trees is less than given in **Table 12** derived from the *South African National Standard (SANS 10400-H: 2012 Edition 3). The Application of the National Building Regulations. Part H: Foundations.*

Table 12: Minimum distance between masonry and centre of trunks of young trees

Description	Minimum distance between buildings and trees (meters)		
	Mature height of tree		
	<8 m	8 m to 15 m	>15 m
Buildings other than single-storey buildings of lightweight construction (for example, timber framed)	-	0.5	1.2
Single-storey buildings of lightweight construction (for example, timber framed)	-	0.7	1.5
Free-standing masonry walls: - distance for prevention of all damage - distance which permits some movement and minor damage which might be tolerable	- -	1.0 -	- 2.0
Drains and underground services: - distance which permits some movement and minor damage which might be tolerable - less than 1 m deep - more than 1 m deep	- 0.5 -	0.5 1.5 1.0	1.0 3.0 2.0
In-situ concrete paths and driveways: - distance for prevention of all direct damage - distance which permits some movement and minor damage which might be tolerable	0.5 -	1.0 0.5	2.5 1.5
Paths and driveways with flexible surfaces, such as asphalt, shale or paving slabs: - distance for prevention of all direct damage - distance which permits some movement and minor damage which might be tolerable	0.7 -	1.5 0.5	3.0 1.0
Note: This table provides guidance on the proximity of young trees or new planting to allow for future growth. This should not be taken that construction work can occur at the specified distance from existing trees, as such work might damage the tree, or render it dangerous, but refers to the potential for future growth, either of a young tree or of planting occurring subsequent to construction.			

7 CONCLUSION

The geotechnical investigation performed has indicated that the proposed area is suitable for the construction of the proposed structures provided that the points given in the report are put to mind.

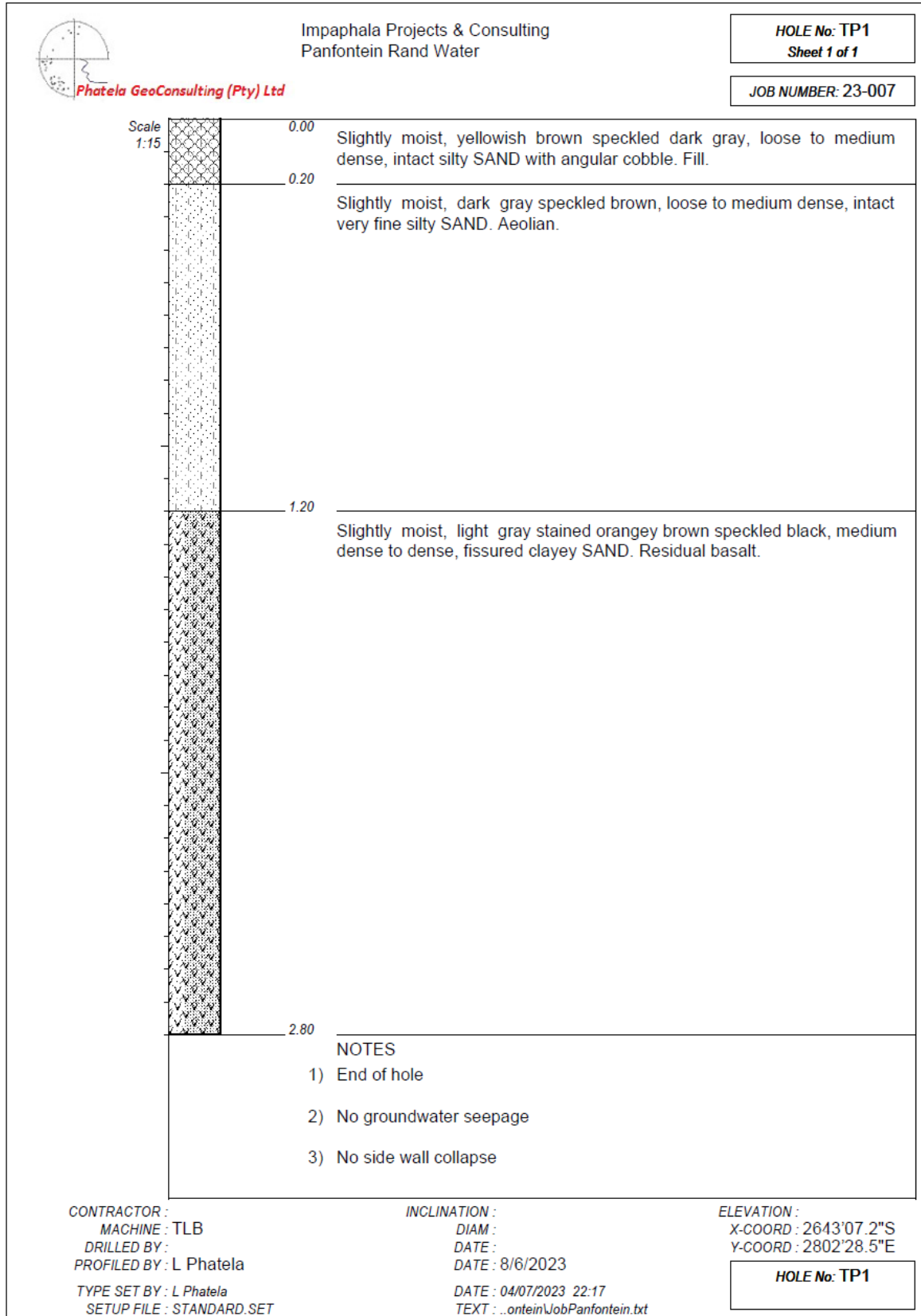
The geotechnical investigation carried out and discussed in the report is based on the assumption that a single and two-storey building will be constructed on the proposed sites. Should this not be the case, further geotechnical investigations might have to be conducted.

The recommendations made are based on, but not limited to, the information obtained from ten test pits, five DCP tests, percolation test and the laboratory results. All test pits indicate a consistent soil profile across the sites. However, it is possible that the ground profile varies at other areas on site where these investigations were not performed. Hence it is recommended that an experienced engineering geologist is engaged to assess the foundation ground conditions during construction to ensure that the ground conditions are as anticipated and to make recommendations if conditions change.

8 REFERENCES

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APPENDIX A: TEST PITS PROFILES



TP1



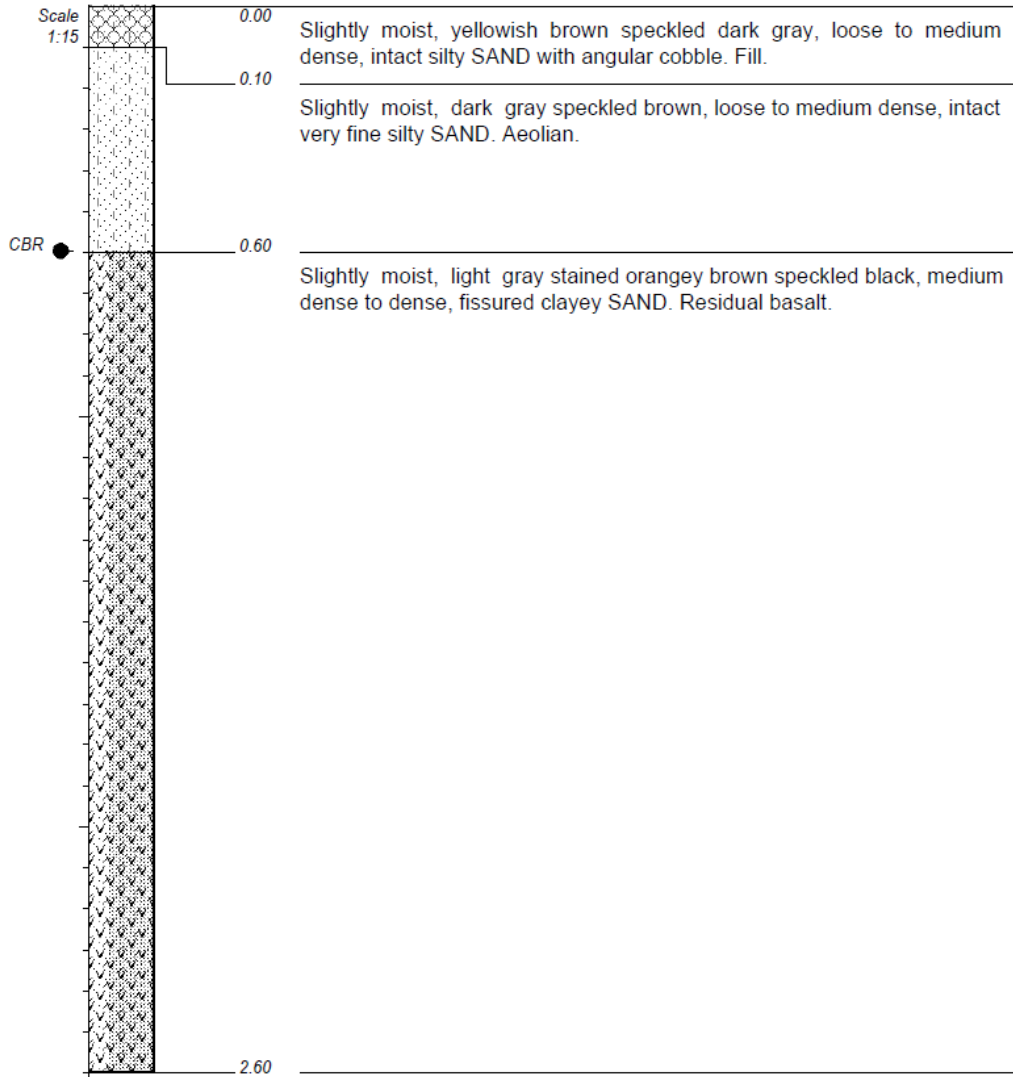


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Panfontein Rand Water

HOLE No: TP2
Sheet 1 of 1

JOB NUMBER: 23-007



NOTES

- 1) End of hole
- 2) No groundwater seepage
- 3) No side wall collapse
- 4) Disturbed sample of Mod CBR, Foundation Indicator, pH, EC, Single Oedometer, Collapse Potential between 0.6 -2.60m

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TYPE SET BY : L Phatela
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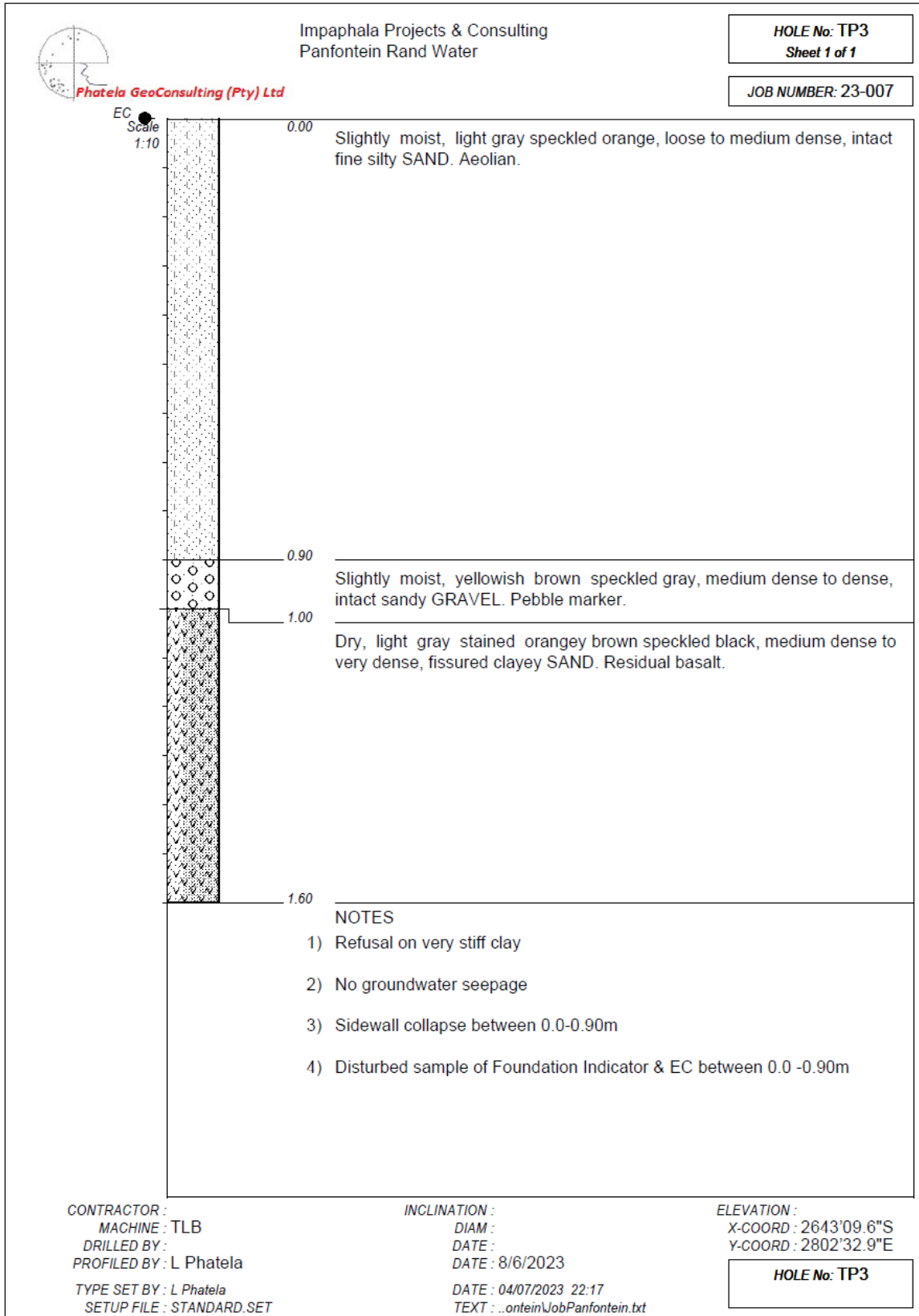
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HOLE No: TP2

TP2





TP3





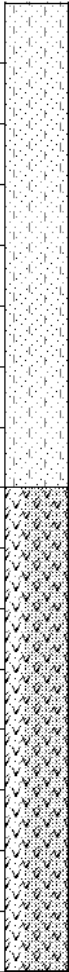
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Panfontein Rand Water

HOLE No: TP4
Sheet 1 of 1

JOB NUMBER: 23-007

Scale
1:10



0.00 Slightly moist, light gray speckled orange, loose to medium dense, intact very fine silty SAND. Aeolian.

0.80 Dry, light gray stained orangey brown speckled black, medium dense to very dense, fissured clayey SAND. Residual basalt.

- 1.60
- NOTES**
- 1) Refusal on very stiff clay
 - 2) No groundwater seepage
 - 3) Sidewall collapse between 0.0-0.80m

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HOLE No: TP4

TP4



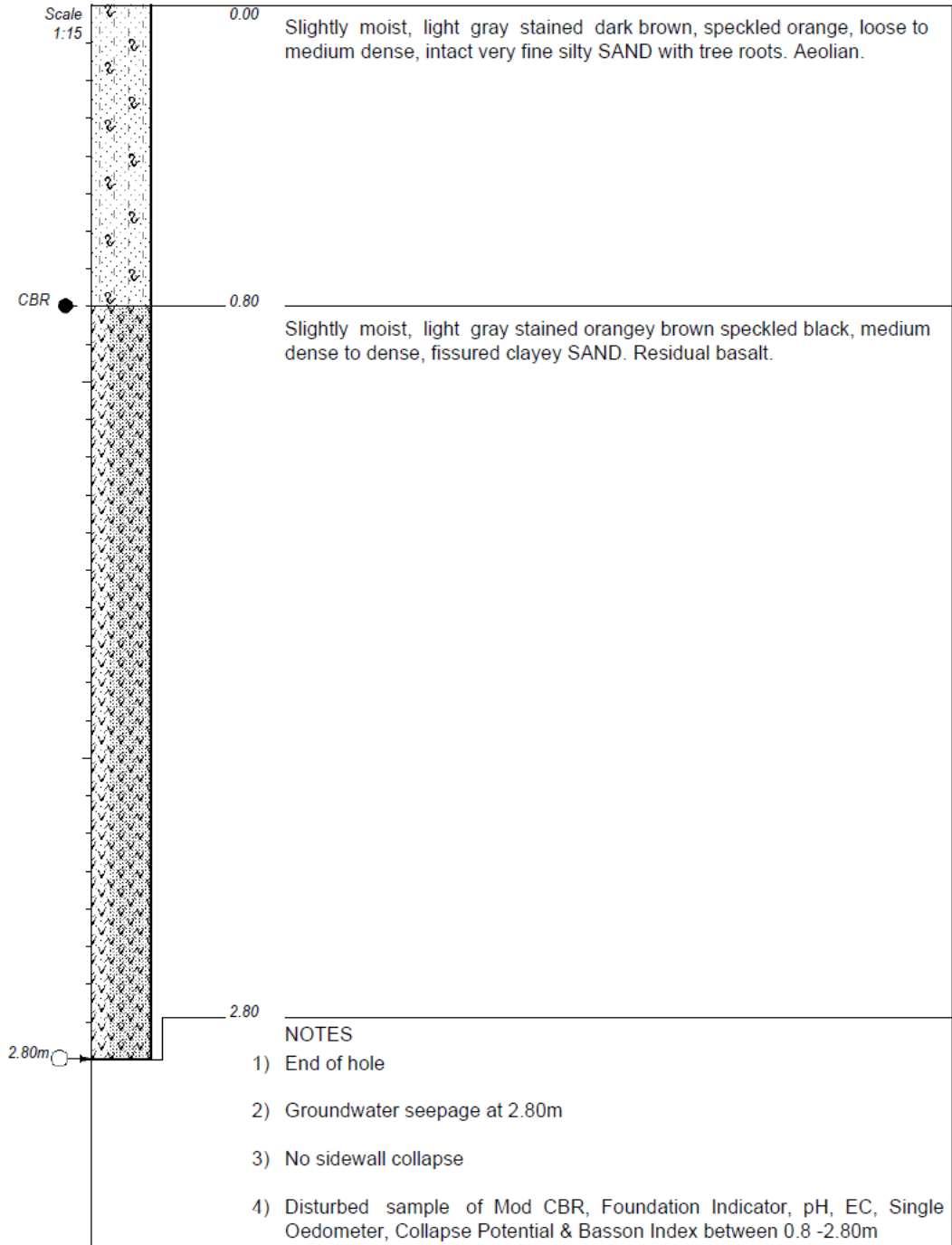


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HOLE No: TP5
Sheet 1 of 1

JOB NUMBER: 23-007



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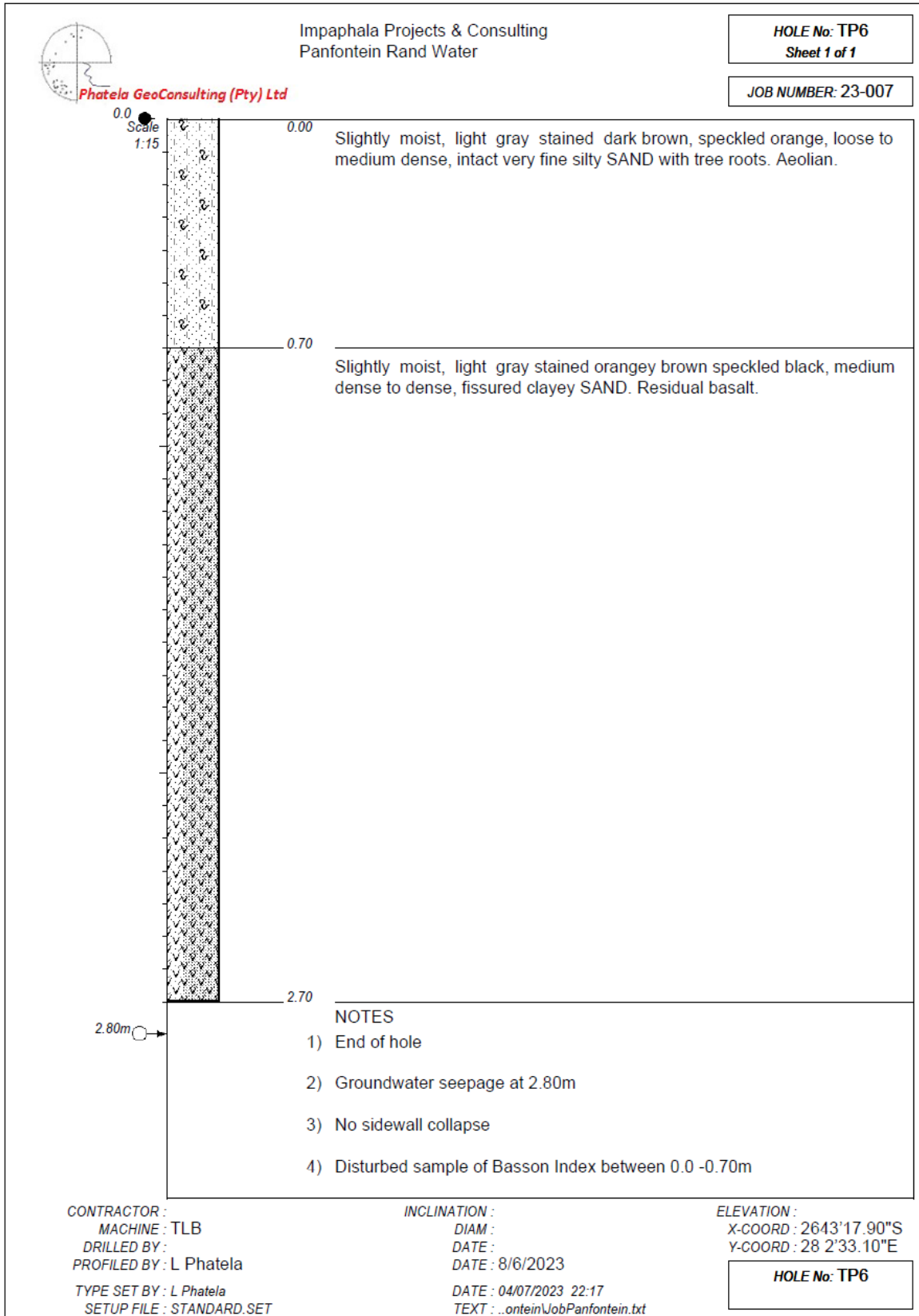
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DATE :
DATE : 8/6/2023
DATE : 04/07/2023 22:17
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ELEVATION :
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Y-COORD : 28 2'34.60"E

HOLE No: TP5

TP5





TP6





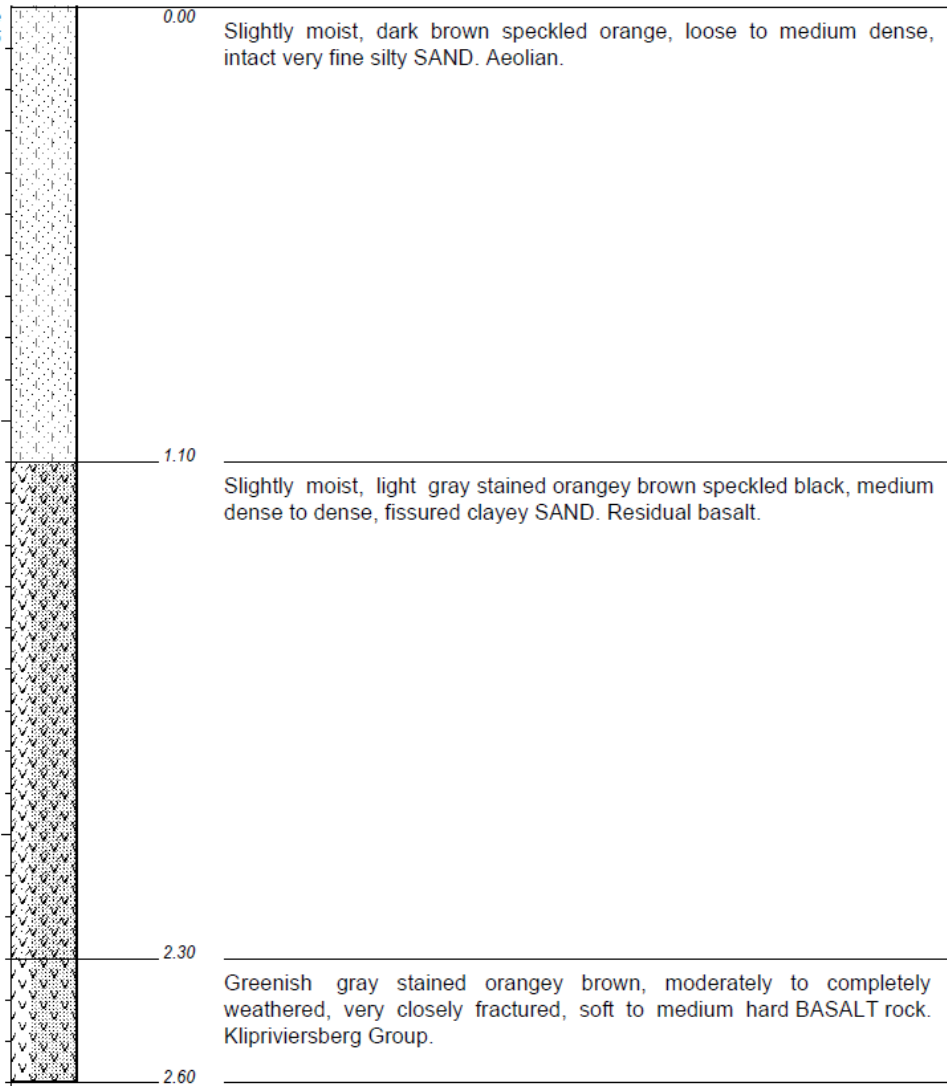
Phatela GeoConsulting (Pty) Ltd

Impaphala Projects & Consulting
Panfontein Rand Water

HOLE No: TP7
Sheet 1 of 1

JOB NUMBER: 23-007

EG
Scale
1:15



NOTES

- 1) End of hole
- 2) No groundwater seepage
- 3) No sidewall collapse
- 4) Disturbed sample of Foundation Indicator & EC between 0.0-1.10m

CONTRACTOR :
MACHINE : TLB
DRILLED BY :
PROFILED BY : L Phatela
TYPE SET BY : L Phatela
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM :
DATE : 8/6/2023
DATE : 04/07/2023 22:17
TEXT : ..ontein\JobPanfontein.txt

ELEVATION :
X-COORD : 2643°05.3"S
Y-COORD : 2801°51.6"E

HOLE No: TP7

TP7





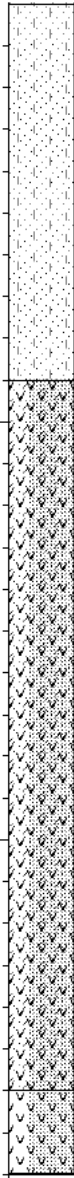
Phatela GeoConsulting (Pty) Ltd

Impaphala Projects & Consulting
Panfontein Rand Water

HOLE No: TP8
Sheet 1 of 1

JOB NUMBER: 23-007

Scale
1:15



0.00 Slightly moist, dark brown speckled orange, loose to medium dense, intact very fine silty SAND. Aeolian.

0.90 Slightly moist, light gray stained orangey brown speckled black, medium dense to dense, fissured clayey SAND. Residual basalt.

2.60 Greenish gray stained orangey brown, moderately to completely weathered, very closely fractured, soft to medium hard BASALT rock. Klipriviersberg Group.

2.80

NOTES

- 1) End of hole
- 2) No groundwater seepage
- 3) No sidewall collapse

CONTRACTOR :
MACHINE : TLB
DRILLED BY :
PROFILED BY : L Phatela
TYPE SET BY : L Phatela
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM :
DATE : 8/6/2023
DATE : 04/07/2023 22:17
TEXT : ..ontein\JobPanfontein.txt

ELEVATION :
X-COORD : 2643'05.6"S
Y-COORD : 2801'52.3"E

HOLE No: TP8

TP8



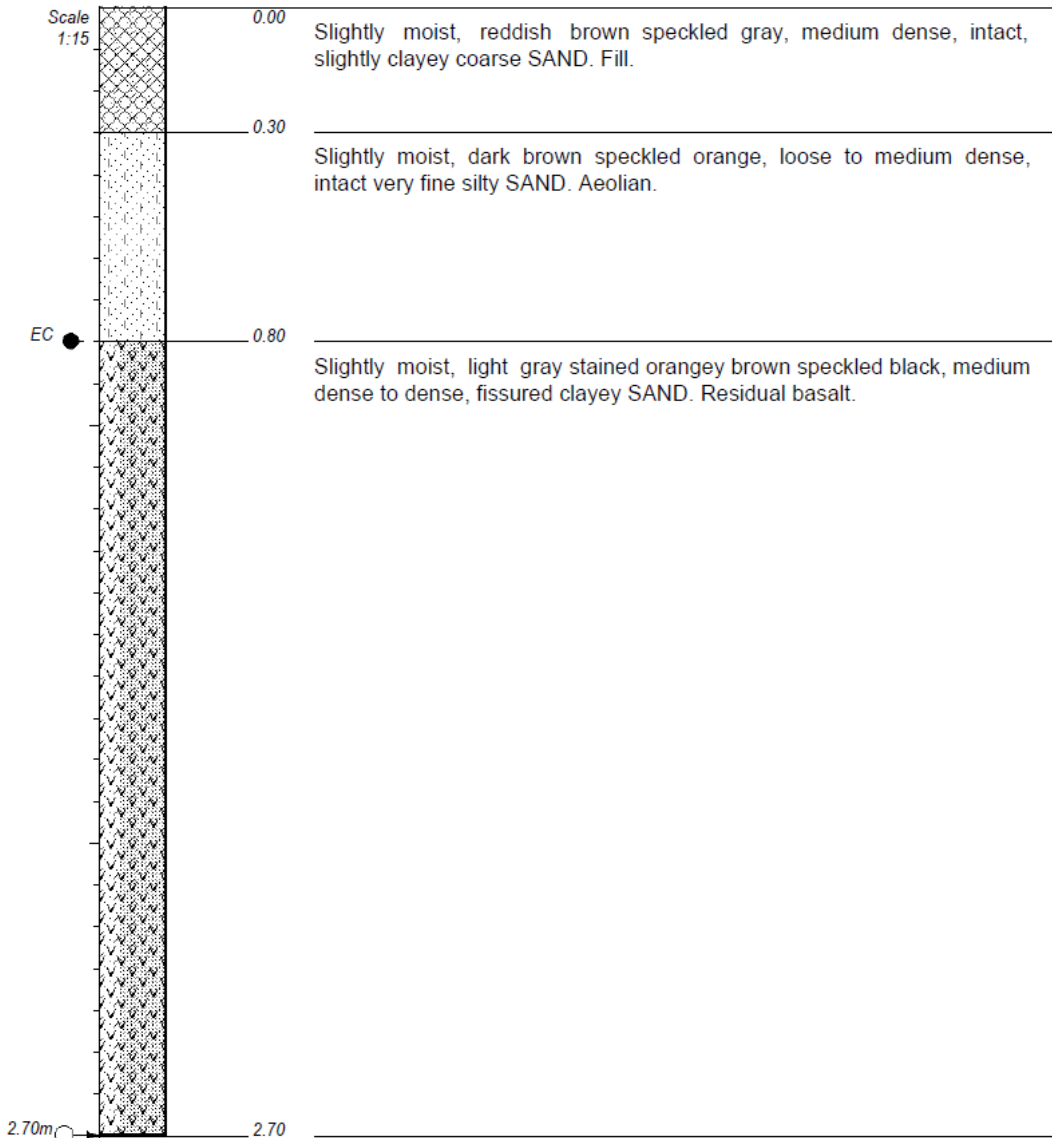


Phatela GeoConsulting (Pty) Ltd

Impaphala Projects & Consulting
Panfontein Rand Water

HOLE No: TP9
Sheet 1 of 1

JOB NUMBER: 23-007



- NOTES**
- 1) End of hole
 - 2) Groundwater seepage at 2.70m
 - 3) No sidewall collapse
 - 4) Disturbed sample of Foundation Indicator & EC between 0.8 -2.70m

CONTRACTOR :
MACHINE : TLB
DRILLED BY :
PROFILED BY : L Phatela
TYPE SET BY : L Phatela
SETUP FILE : STANDARD.SET

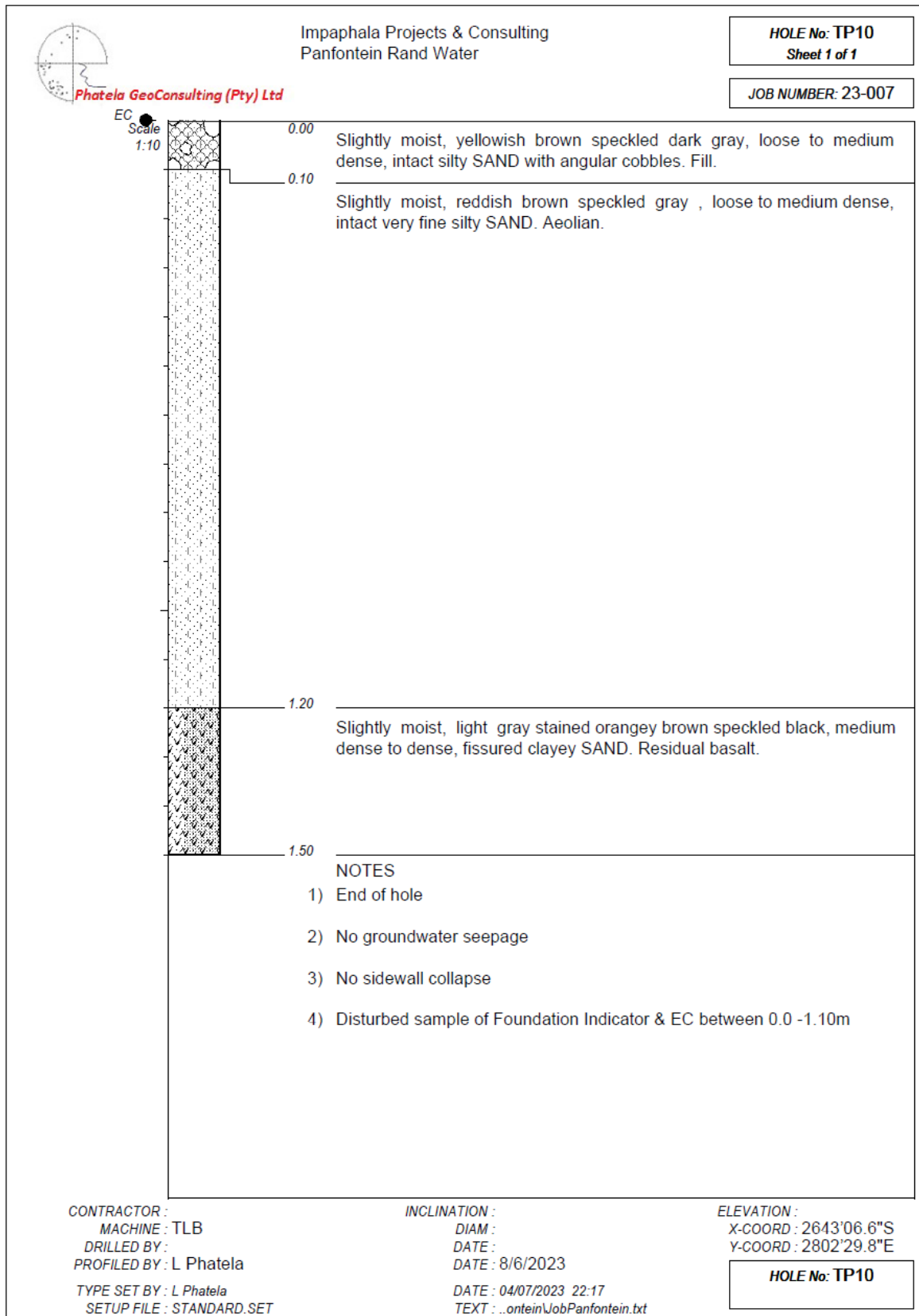
INCLINATION :
DIAM :
DATE : 8/6/2023
DATE : 04/07/2023 22:17
TEXT : ..ontein\JobPanfontein.txt

ELEVATION :
X-COORD : 2642'21.1"S
Y-COORD : 2801'56.1"E

HOLE No: TP9

TP9





TP10





Phatela GeoConsulting (Pty) Ltd

Impaphala Projects & Consulting
Panfontein Rand Water

LEGEND
Sheet 1 of 1

JOB NUMBER: 23-007

	GRAVEL	{SA02}
	SAND	{SA04}
	SANDY	{SA05}
	SILTY	{SA07}
	CLAYEY	{SA09}
	BASALT	{SA19}{SA42}
	FILL	{SA32}
Name ●	DISTURBED SAMPLE	{SA38}
	ROOTS	{SA40}
9.5 →	WATER SEEPAGE/water strike	{CH50}
	COBBLES	{SA58}

CONTRACTOR :
MACHINE :
DRILLED BY :
PROFILED BY :

INCLINATION :
DIAM :
DATE :
DATE :

ELEVATION :
X-COORD :
Y-COORD :

TYPE SET BY : L Phatela
SETUP FILE : STANDARD.SET

DATE : 04/07/2023 22:17
TEXT : ..ontein\JobPanfontein.txt

LEGEND
SUMMARY OF SYMBOLS

APPENDIX B: DYANAMIC CONE PENETRATION TESTS RESULTS

EASBP FROM DCP

8kg Hammer 20mm point

Job Name Panfontein Rand Water

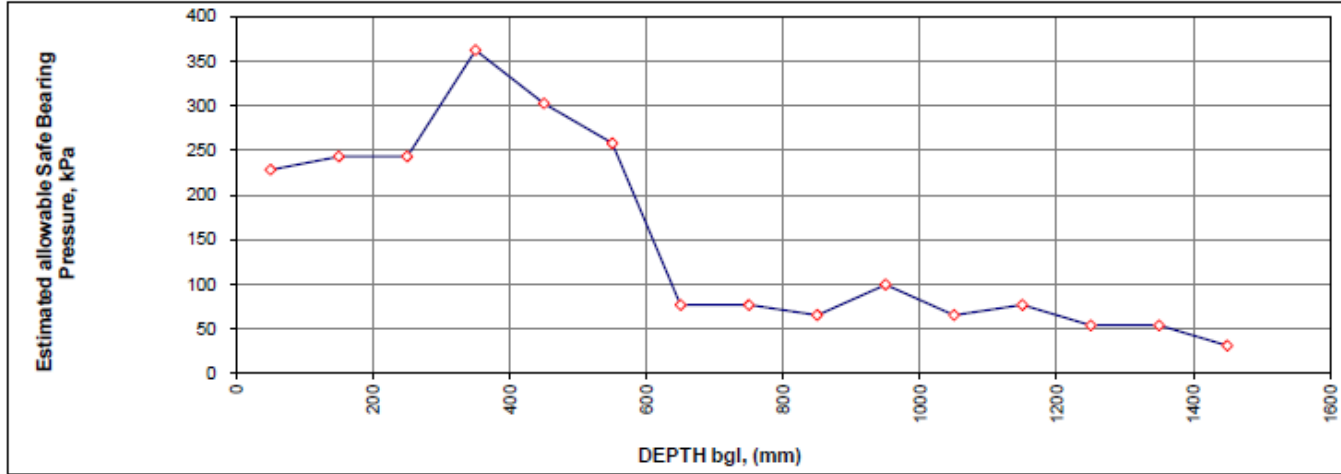
File No: 23-07

Job No: 23-07

Date of Test: Jun-23

DCP No: Location: S E

note: EASBP from Terzaghi & Peck p491 for 25mm settlement



Depth of hole in which DCP was taken :

mm below NGL

Applied Factor :

times Terzaghi's value

SPT = 1.2 DN

Remarks : No Refusal

Reading No.	Layer From	Layer To	Average Layer Depth	DCP DN Blows/100mm	Level Below NGL penetration mm	DCP mm/blow	Equiv. SPT N Value	Approx In-situ CBR	Approx EASBP kPa
1	0	100	50	14	50	7	17	35	228
2	100	200	150	15	150	7	18	39	243
3	200	300	250	15	250	7	18	39	243
4	300	400	350	23	350	4	28	68	362
5	400	500	450	19	450	5	23	53	303
6	500	600	550	16	550	6	19	42	258
7	600	700	650	5	650	20	6	9	77
8	700	800	750	5	750	20	6	9	77
9	800	900	850	4	850	25	5	7	66
10	900	1000	950	7	950	14	8	14	100
11	1000	1100	1050	4	1050	25	5	7	66
12	1100	1200	1150	5	1150	20	6	9	77
13	1200	1300	1250	3	1250	33	4	5	54
14	1300	1400	1350	3	1350	33	4	5	54
15	1400	1500	1450	1	1450	100	1	0	31

EASBP FROM DCP

8kg Hammer 20mm point

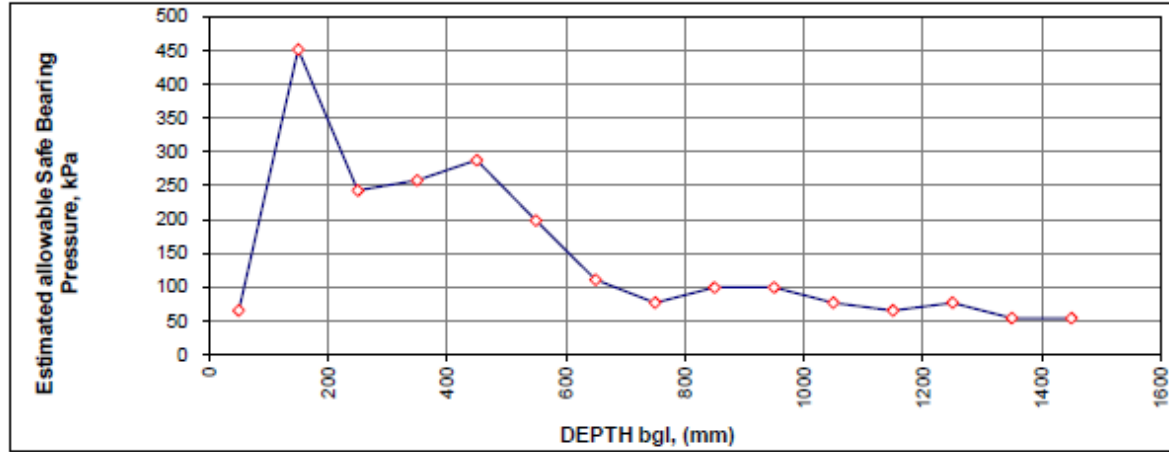
Job Name Panfontein Rand Water

File No: 23-07 Job No: 23-07

Date of Test: Jun-23

DCP No: Location: S E

note: EASBP from Terzaghi & Peck p491 for 25mm settlement



Depth of hole in which DCP was taken : mm below NGL

Applied Factor : times Terzaghi's value

SPT = 1.2 DN

Remarks : No Refusal

Reading No.	Layer From	Layer To	Average Layer Depth	DCP DN Blows/100mm	Level Below NGL penetration mm	DCP mm/blow	Equiv. SPT N Value	Approx In-situ CBR	Approx EASBP kPa
1	0	100	50	4	50	25	5	7	66
2	100	200	150	29	150	3	35	92	452
3	200	300	250	15	250	7	18	39	243
4	300	400	350	16	350	6	19	42	258
5	400	500	450	18	450	6	22	49	288
6	500	600	550	12	550	8	14	29	199
7	600	700	650	8	650	13	10	17	111
8	700	800	750	5	750	20	6	9	77
9	800	900	850	7	850	14	8	14	100
10	900	1000	950	7	950	14	8	14	100
11	1000	1100	1050	5	1050	20	6	9	77
12	1100	1200	1150	4	1150	25	5	7	66
13	1200	1300	1250	5	1250	20	6	9	77
14	1300	1400	1350	3	1350	33	4	5	54
15	1400	1500	1450	3	1450	33	4	5	54

EASBP FROM DCP

8kg Hammer 20mm point

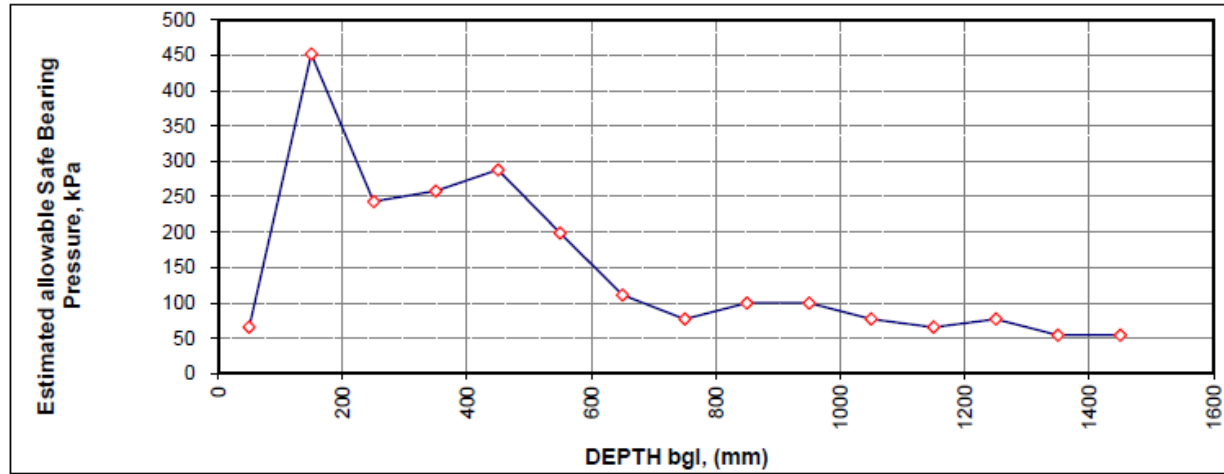
Job Name Panfontein Rand Water

File No: 23-07 Job No: 23-07

Date of Test: Jun-23

DCP No: Location:

note: EASBP from Terzaghi & Peck p491 for 25mm settlement



Depth of hole in which DCP was taken : mm below NGL

Applied Factor : times Terzaghi's value

SPT = 1.2 DN

Remarks : No Refusal

Reading No.	Layer From	Layer To	Average Layer Depth	DCP DN Blows/100mm	Level Below NGL penetration mm	DCP mm/blow	Equiv. SPT N Value	Approx In-situ CBR	Approx EASBP kPa
1	0	100	50	4	50	25	5	7	66
2	100	200	150	29	150	3	35	92	452
3	200	300	250	15	250	7	18	39	243
4	300	400	350	16	350	6	19	42	258
5	400	500	450	18	450	6	22	49	288
6	500	600	550	12	550	8	14	29	199
7	600	700	650	8	650	13	10	17	111
8	700	800	750	5	750	20	6	9	77
9	800	900	850	7	850	14	8	14	100
10	900	1000	950	7	950	14	8	14	100
11	1000	1100	1050	5	1050	20	6	9	77
12	1100	1200	1150	4	1150	25	5	7	66
13	1200	1300	1250	5	1250	20	6	9	77
14	1300	1400	1350	3	1350	33	4	5	54
15	1400	1500	1450	3	1450	33	4	5	54

EASBP FROM DCP

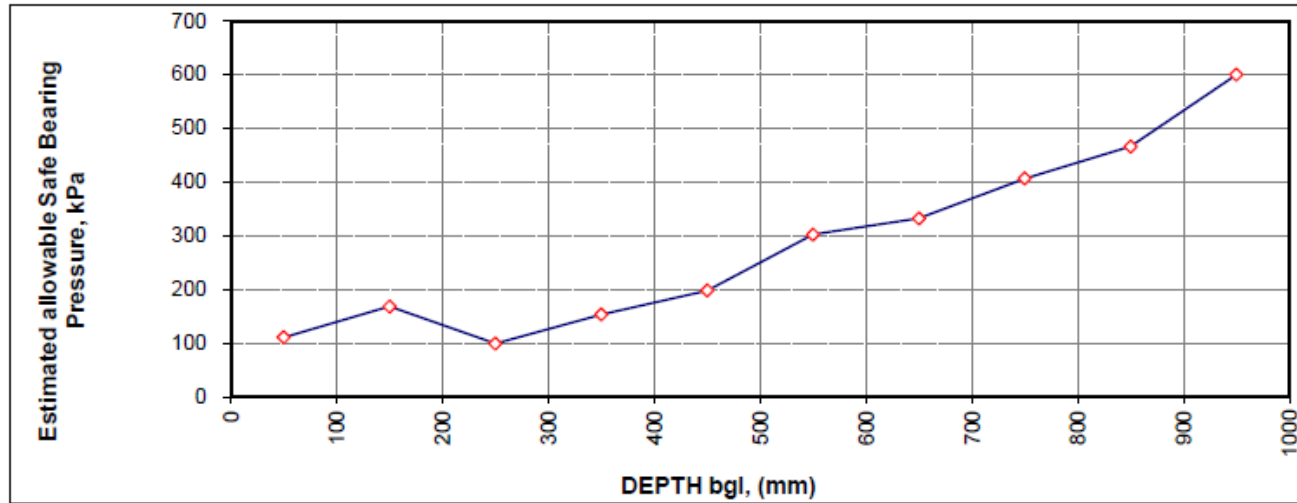
8kg Hammer 20mm point

Job Name Panfontein Rand Water
 File No: 23-07 Job No: 23-07

Date of Test: Jun-23

DCP No: Location: S E

note: EASBP from Terzaghi & Peck p491 for 25mm settlement



Depth of hole in which DCP was taken : mm below NGL

Applied Factor : times Terzaghi's value SPT = 1.2 DN

Remarks : Refusal @1000mm

Reading No.	Layer From	Layer To	Average Layer Depth	DCP DN Blows/100mm	Level Below NGL penetration mm	DCP mm/blow	Equiv. SPT N Value	Approx In-situ CBR	Approx EASBP kPa
1	0	100	50	8	50	13	10	17	111
2	100	200	150	10	150	10	12	23	169
3	200	300	250	7	250	14	8	14	100
4	300	400	350	9	350	11	11	20	154
5	400	500	450	12	450	8	14	29	199
6	500	600	550	19	550	5	23	53	303
7	600	700	650	21	650	5	25	60	332
8	700	800	750	26	750	4	31	80	407
9	800	900	850	30	850	3	36	96	466
10	900	1000	950	50	950	2	60	110	600

EASBP FROM DCP

8kg Hammer 20mm point

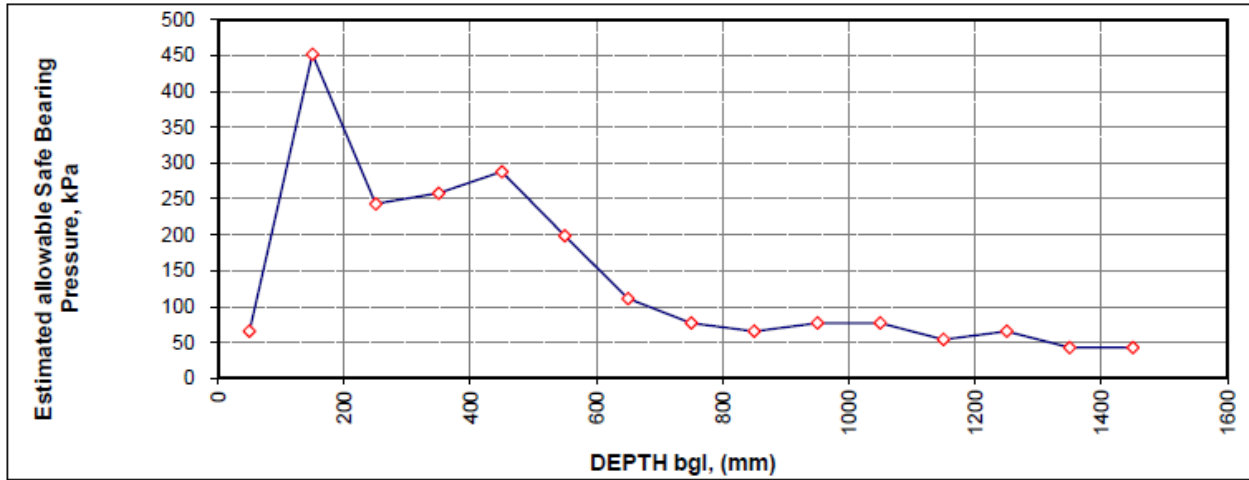
Job Name Panfontein Rand Water

File No: 23-07 Job No: 23-07

Date of Test: Jun-23

DCP No: Location: S E

note: EASBP from Terzaghi & Peck p491 for 25mm settlement



Depth of hole in which DCP was taken : mm below NGL

Applied Factor : times Terzaghi's value

SPT = 1.2 DN

Remarks : No Refusal

Reading No.	Layer From	Layer To	Average Layer Depth	DCP DN Blows/100mm	Level Below NGL penetration mm	DCP mm/blow	Equiv. SPT N Value	Approx In-situ CBR	Approx EASBP kPa
1	0	100	50	4	50	25	5	7	66
2	100	200	150	29	150	3	35	92	452
3	200	300	250	15	250	7	18	39	243
4	300	400	350	16	350	6	19	42	258
5	400	500	450	18	450	6	22	49	288
6	500	600	550	12	550	8	14	29	199
7	600	700	650	8	650	13	10	17	111
8	700	800	750	5	750	20	6	9	77
9	800	900	850	4	850	25	5	7	66
10	900	1000	950	5	950	20	6	9	77
11	1000	1100	1050	5	1050	20	6	9	77
12	1100	1200	1150	3	1150	33	4	5	54
13	1200	1300	1250	4	1250	25	5	7	66
14	1300	1400	1350	2	1350	50	2	3	43
15	1400	1500	1450	2	1450	50	2	3	43

APPENDIX C: LABORATORY TESTS RESULTS

TEST REPORT

S23/0353

For

PHATELA GEOCONSULTING
UNIT 39 LIVINGSTON COMPLEX
EDGAR STREET
NOORDWYK
MIDRAND

Date

2023-06-27

Attention

LIMPHO PHATELA

Your Reference

PANFONTEIN



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Sample(s)	Test(s) Conducted	Date requested	Test Method(s) used	Sampling method & Date	Test(s) done at	Test(s) dates
S23/0353/1	<ul style="list-style-type: none"> Foundation Indicator (rel. density, sieve analysis to 0.002mm & Atterberg limits) Untreated Material - Mod. AASHTO Effort CBR Compaction and Penetration @ Mod. AASHTO, NRB & Proctor Efforts(excl. M/D determination)**** pH Value Electrical Conductivity 	2023-06-20	<ul style="list-style-type: none"> SANS 3001-GR1, GR3, GR10, TMH1 A12T SANS 3001 GR30 SANS 3001 GR40 TMH1 A20 TMH1 A21T 	Sampling by client	PRETORIA	2023-06-20 2023-06-27
S23/0353/4	<ul style="list-style-type: none"> Foundation Indicator (rel. density, sieve analysis to 0.002mm & Atterberg limits) 	2023-06-20	<ul style="list-style-type: none"> SANS 3001-GR1, GR3, GR10, TMH1 A12T 			
S23/0353/7	<ul style="list-style-type: none"> Foundation Indicator (rel. density, sieve analysis to 0.002mm & Atterberg limits) Untreated Material - Mod. AASHTO Effort CBR Compaction and Penetration @ Mod. AASHTO, NRB & Proctor Efforts(excl. M/D determination)**** pH Value Electrical Conductivity 	2023-06-20	<ul style="list-style-type: none"> SANS 3001-GR1, GR3, GR10, TMH1 A12T SANS 3001 GR30 SANS 3001 GR40 TMH1 A20 TMH1 A21T 			
S23/0353/9	<ul style="list-style-type: none"> Foundation Indicator (rel. density, sieve analysis to 0.002mm & Atterberg limits) pH Value Electrical Conductivity 	2023-06-20	<ul style="list-style-type: none"> SANS 3001-GR1, GR3, GR10, TMH1 A12T TMH1 A20 TMH1 A21T 			

Sample(s)	Test(s) Conducted	Date requested	Test Method(s) used	Sampling method & Date	Test(s) done at	Test(s) dates
S23/0353/11	<ul style="list-style-type: none"> Foundation Indicator (rel. density, sieve analysis to 0.002mm & Atterberg limits) pH Value Electrical Conductivity 	2023-06-20	<ul style="list-style-type: none"> SANS 3001-GR1, GR3, GR10, TMH1 A12T TMH1 A20 TMH1 A21T 	Sampling by client	PRETORIA	2023-06-20 2023-06-27
S23/0353/13	<ul style="list-style-type: none"> Foundation Indicator (rel. density, sieve analysis to 0.002mm & Atterberg limits) pH Value Electrical Conductivity 	2023-06-20	<ul style="list-style-type: none"> SANS 3001-GR1, GR3, GR10, TMH1 A12T TMH1 A20 TMH1 A21T 			

Note: **** Decision rule not be applied to the Colto Classification, please enquire if required.
 *** Non-standard aggregate sizes used in test. Generally smaller aggregates will produce lower values and the larger sizes higher values.
 ** Used tap water to wash and not distilled water.
 * Not SANAS Accredited:
 Results marked "Not SANAS Accredited" in this report are not included in the SANAS Schedule of Accreditation for this laboratory / certification body / inspection body.
 Sample and sampling environmental conditions will only be noted if it is abnormal, not according to test method specification or can have an influence on the final result.
 The test results are only applicable to the samples tested.



Mantsha Choeu
 27/06/2023 13:55:45(UTC+00:00)
 I Accept this document.

I accept this document
 Ms M Choeu
 Technical Signatory (Soils)

The results relate only to the items tested.
 Opinions and interpretations expressed herein are outside the scope of SANAS accreditation.
 Refer to the Scope of Accreditation for details regarding the technical signatories.
 This test report shall not be reproduced except in full, without written approval of the laboratory.

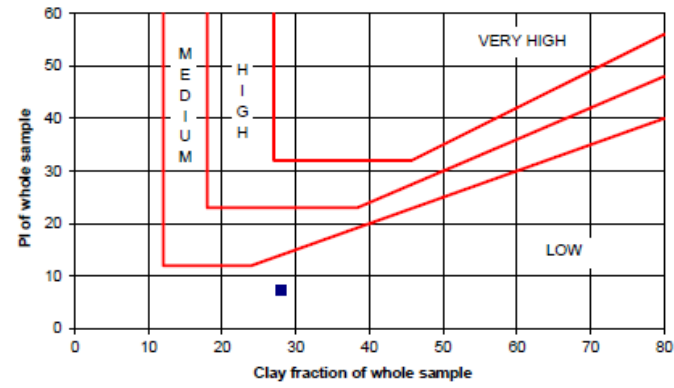
R54 revision 1

PARTICLE SIZE ANALYSIS

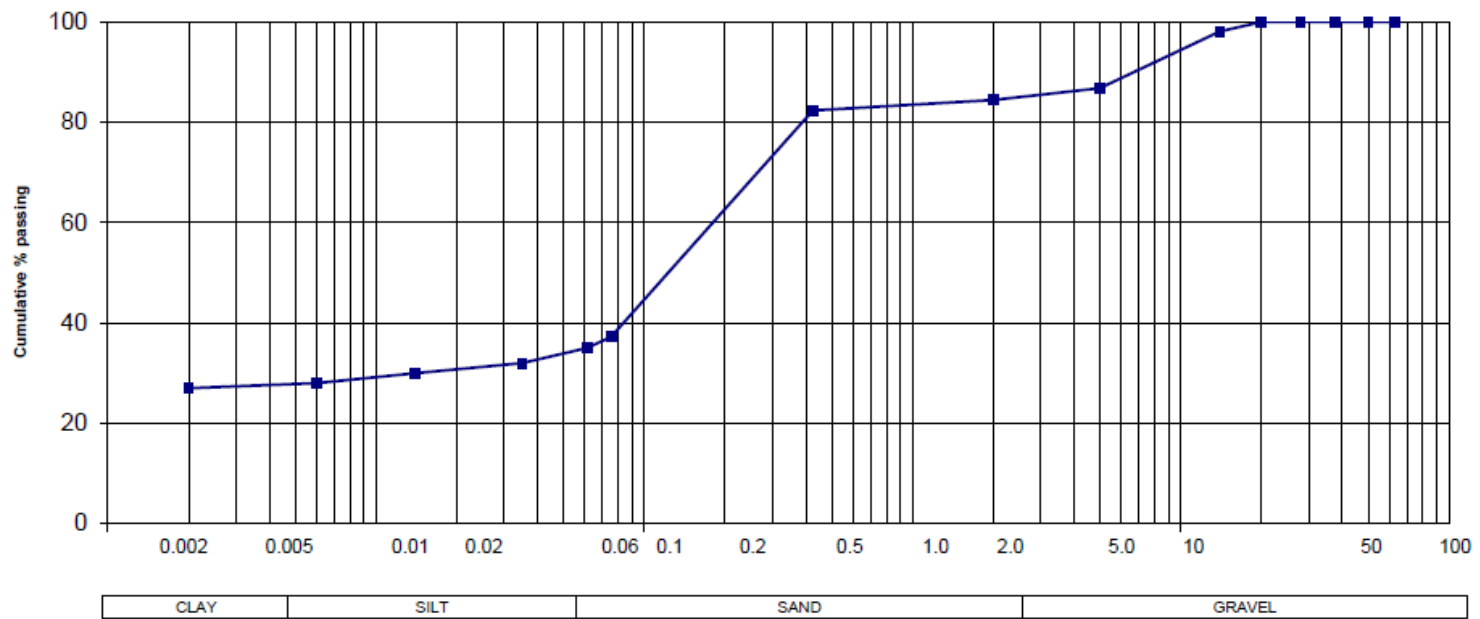
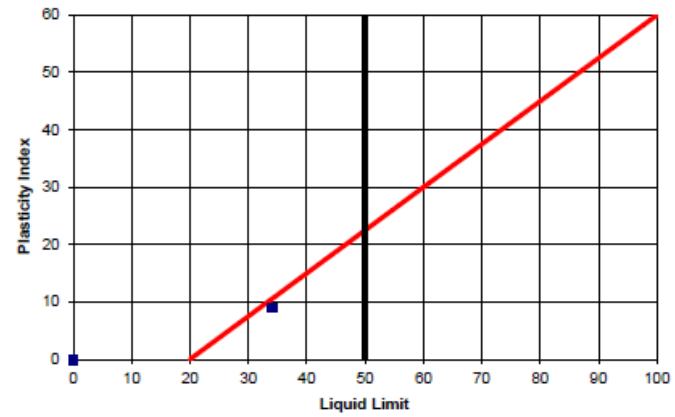
Sample No.	01
Soillab Sample No.	S23-0353-01
Depth (mM)	0.6 - 2.6
Position	TP02
Material Description	DARK YELLOW CLAYEY SAND
Relative density on < 2 mm (TMH1 A12T)	2.527
Organic Material	
Moisture (%)	
SCREEN ANALYSIS (% PASSING) (SANS 3001:GR1)	
63.0 mm	100
50.0 mm	100
37.5 mm	100
28.0 mm	100
20.0 mm	100
14.0 mm	98
5.0 mm	87
2.00 mm	84
0.425 mm	82
0.075 mm	37
HYDROMETER ANALYSIS (% PASSING) (SANS 3001:GR3)	
61 µm	35
35 µm	32
14 µm	30
6 µm	28
2 µm	27
% Clay	28
% Silt	7
% Sand	49
% Gravel	16
ATTERBERG LIMITS (SANS 3001:GR10)	
Liquid Limit	34
Plasticity Index	9
Linear Shrinkage (%)	4.0
Grading Modulus	0.96
Classification	A-4 (0)
Unified Classification	SM
Chart Reference	

PROJECT : PANFONTEIN
 JOB No. : S23-0353
 DATE : 2023-06-27

POTENTIAL EXPANSIVENESS



PLASTICITY CHART



Engineering Materials Laboratory
 T +27 12 813 4800 E info@soillab.co.za
 Soillab Pretoria
 www.soillab.co.za

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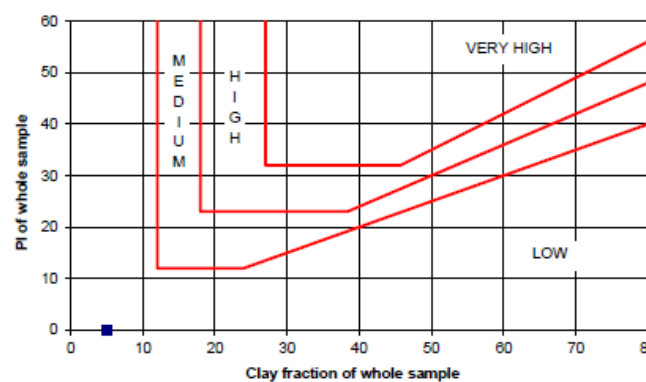
R54 revision 1

PARTICLE SIZE ANALYSIS

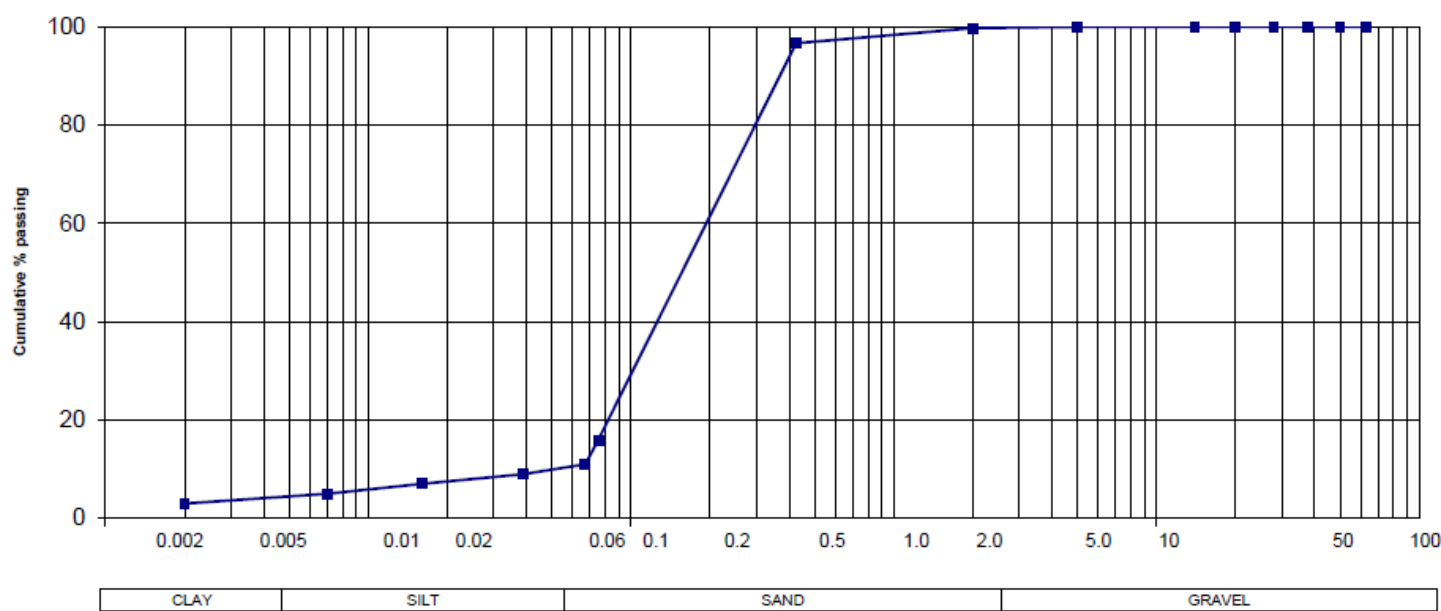
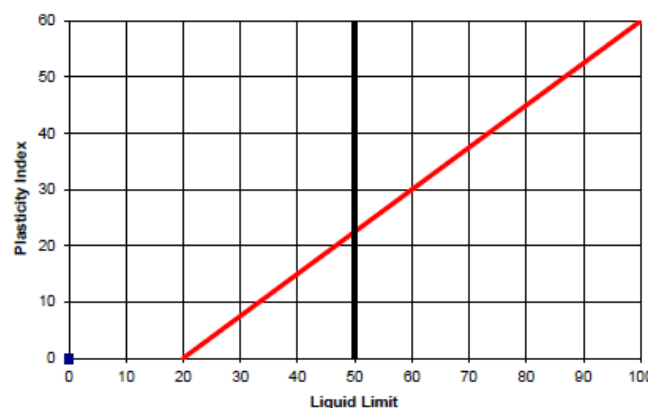
Sample No.	02
Soillab Sample No.	S23-0353-02
Depth (mM)	0.0 - 0.9
Position	TP03
Material Description	LIGHT GREY SILTY SAND
Relative density on < 2 mm (TMH1 A12T)	2.585
Organic Material	
Moisture (%)	
SCREEN ANALYSIS (% PASSING) (SANS 3001:GR1)	
63.0 mm	100
50.0 mm	100
37.5 mm	100
28.0 mm	100
20.0 mm	100
14.0 mm	100
5.0 mm	100
2.00 mm	100
0.425 mm	97
0.075 mm	16
HYDROMETER ANALYSIS (% PASSING) (SANS 3001:GR3)	
67 µm	11
39 µm	9
16 µm	7
7 µm	5
2 µm	3
% Clay	5
% Silt	6
% Sand	89
% Gravel	0
ATTERBERG LIMITS (SANS 3001:GR10)	
Liquid Limit	
Plasticity Index	NP
Linear Shrinkage (%)	0.0
Grading Modulus	0.88
Classification	A-2-4 (0)
Unified Classification	SM
Chart Reference	

PROJECT : PANFONTEIN
JOB No. : S23-0353
DATE : 2023-06-27

POTENTIAL EXPANSIVENESS



PLASTICITY CHART



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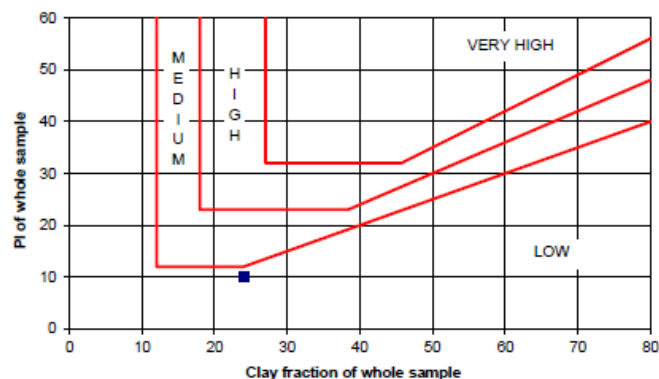
R54 revision 1

PARTICLE SIZE ANALYSIS

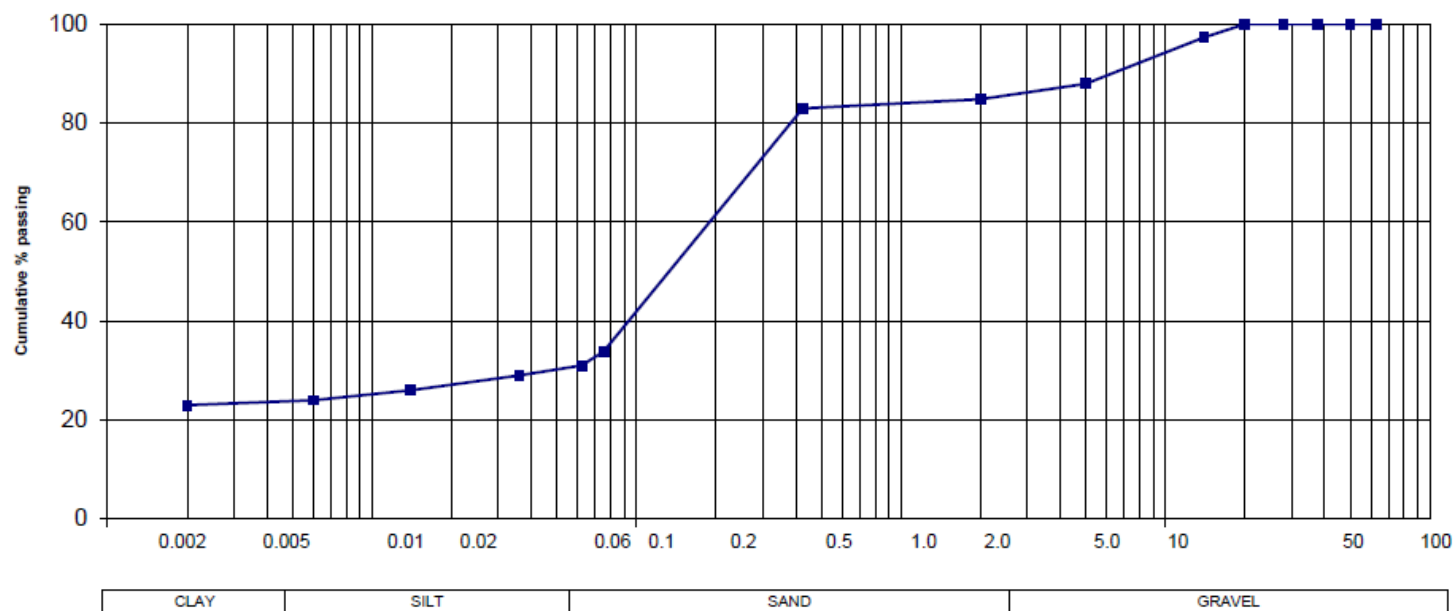
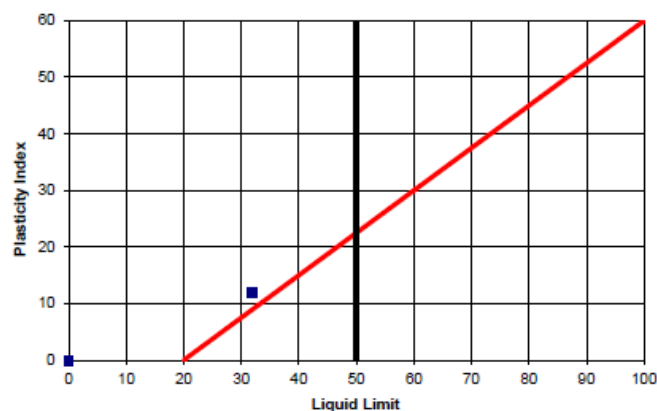
Sample No.	03
Soillab Sample No.	S23-0353-03
Depth (mM)	0.8 - 2.8
Position	TP05
Material Description	DARK YELLOW CLAYEY SAND
Relative density on < 2 mm (TMH1 A12T)	2.634
Organic Material	
Moisture (%)	
SCREEN ANALYSIS (% PASSING) (SANS 3001:GR1)	
63.0 mm	100
50.0 mm	100
37.5 mm	100
28.0 mm	100
20.0 mm	100
14.0 mm	97
5.0 mm	88
2.00 mm	85
0.425 mm	83
0.075 mm	34
HYDROMETER ANALYSIS (% PASSING) (SANS 3001:GR3)	
62 µm	31
36 µm	29
14 µm	26
6 µm	24
2 µm	23
% Clay	24
% Silt	7
% Sand	54
% Gravel	15
ATTERBERG LIMITS (SANS 3001:GR10)	
Liquid Limit	32
Plasticity Index	12
Linear Shrinkage (%)	4.0
Grading Modulus	0.98
Classification	A-2-6 (0)
Unified Classification	SC
Chart Reference	

PROJECT : PANFONTEIN
JOB No. : S23-0353
DATE : 2023-06-27

POTENTIAL EXPANSIVENESS



PLASTICITY CHART



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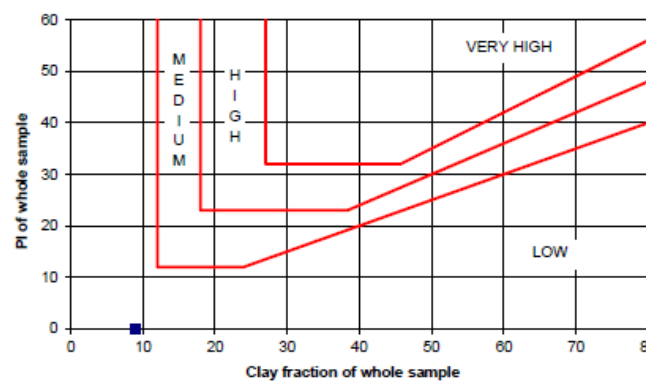
R54 revision 1

PARTICLE SIZE ANALYSIS

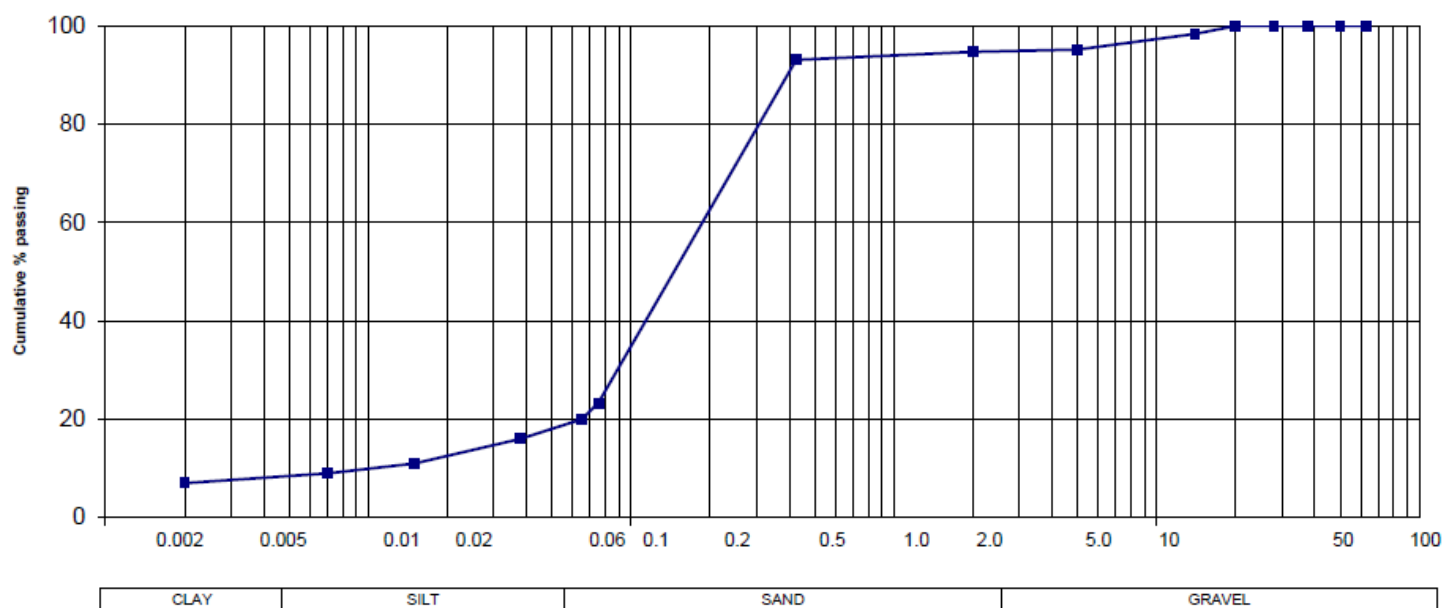
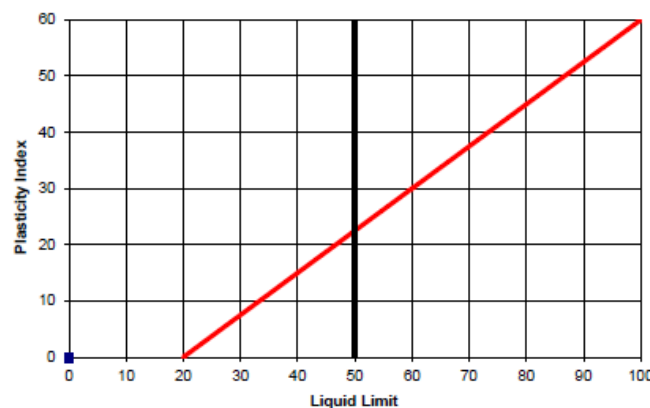
Sample No.	04
Soillab Sample No.	S23-0353-04
Depth (mM)	0.0 - 1.10
Position	TP07
Material Description	DARK BROWN SILTY SAND
Relative density on < 2 mm (TMH1 A12T)	2.621
Organic Material	
Moisture (%)	
SCREEN ANALYSIS (% PASSING) (SANS 3001:GR1)	
63.0 mm	100
50.0 mm	100
37.5 mm	100
28.0 mm	100
20.0 mm	100
14.0 mm	98
5.0 mm	95
2.00 mm	95
0.425 mm	93
0.075 mm	23
HYDROMETER ANALYSIS (% PASSING) (SANS 3001:GR3)	
65 µm	20
38 µm	16
15 µm	11
7 µm	9
2 µm	7
% Clay	9
% Silt	11
% Sand	75
% Gravel	5
ATTERBERG LIMITS (SANS 3001:GR10)	
Liquid Limit	
Plasticity Index	NP
Linear Shrinkage (%)	0.0
Grading Modulus	0.89
Classification	A-2-4 (0)
Unified Classification	SM
Chart Reference	

PROJECT : PANFONTEIN
JOB No. : S23-0353
DATE : 2023-06-27

POTENTIAL EXPANSIVENESS



PLASTICITY CHART



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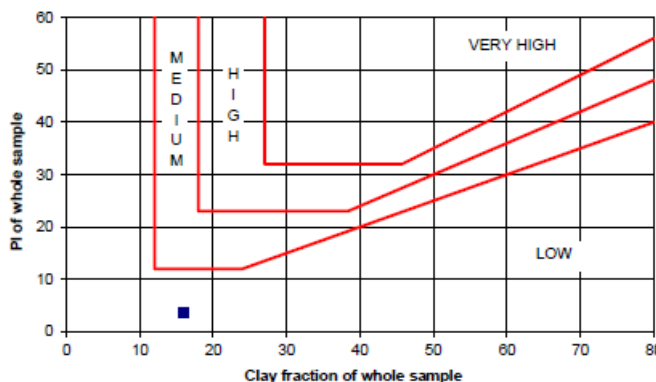
R54 revision 1

PARTICLE SIZE ANALYSIS

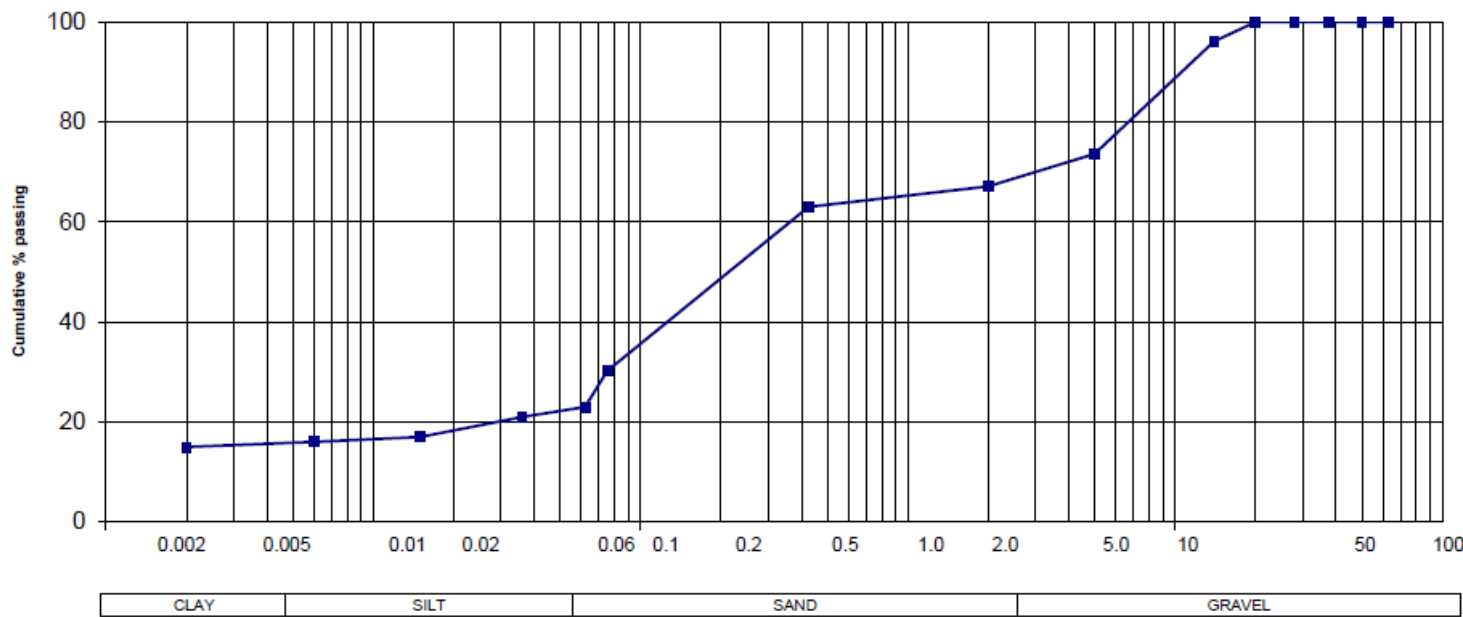
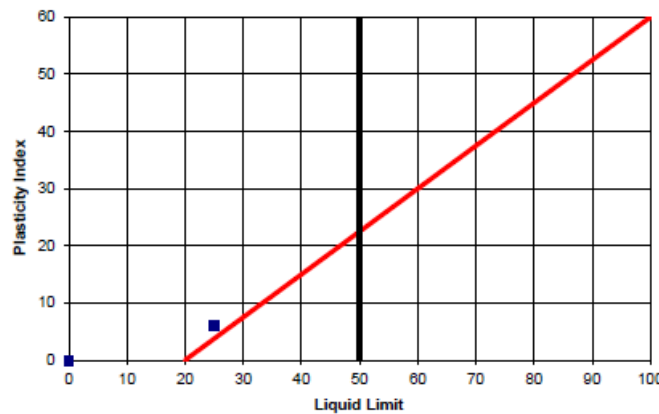
Sample No.	05
Soillab Sample No.	S23-0353-05
Depth (mM)	0.8 - 2.70
Position	TP09
Material Description	DARK YELLOW GRAVELLY SAND
Relative density on < 2 mm (TMH1 A12T)	2.638
Organic Material	
Moisture (%)	
SCREEN ANALYSIS (% PASSING) (SANS 3001:GR1)	
63.0 mm	100
50.0 mm	100
37.5 mm	100
28.0 mm	100
20.0 mm	100
14.0 mm	96
5.0 mm	74
2.00 mm	67
0.425 mm	63
0.075 mm	30
HYDROMETER ANALYSIS (% PASSING) (SANS 3001:GR3)	
62 µm	23
36 µm	21
15 µm	17
6 µm	16
2 µm	15
% Clay	16
% Silt	7
% Sand	44
% Gravel	33
ATTERBERG LIMITS (SANS 3001:GR10)	
Liquid Limit	25
Plasticity Index	6
Linear Shrinkage (%)	3.0
Grading Modulus	1.40
Classification	A-2-4 (0)
Unified Classification	SM & SC
Chart Reference	

PROJECT : PANFONTEIN
JOB No. : S23-0353
DATE : 2023-06-27

POTENTIAL EXPANSIVENESS



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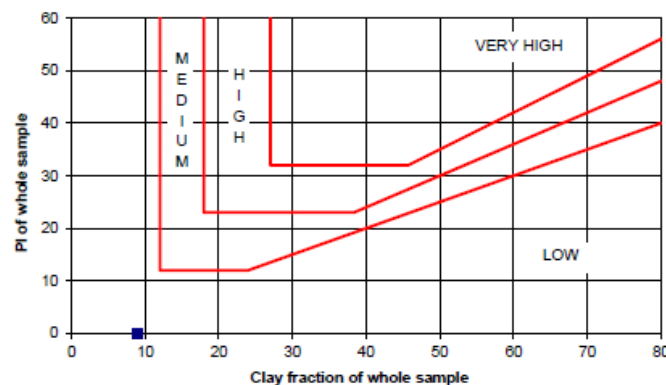
R54 revision 1

PARTICLE SIZE ANALYSIS

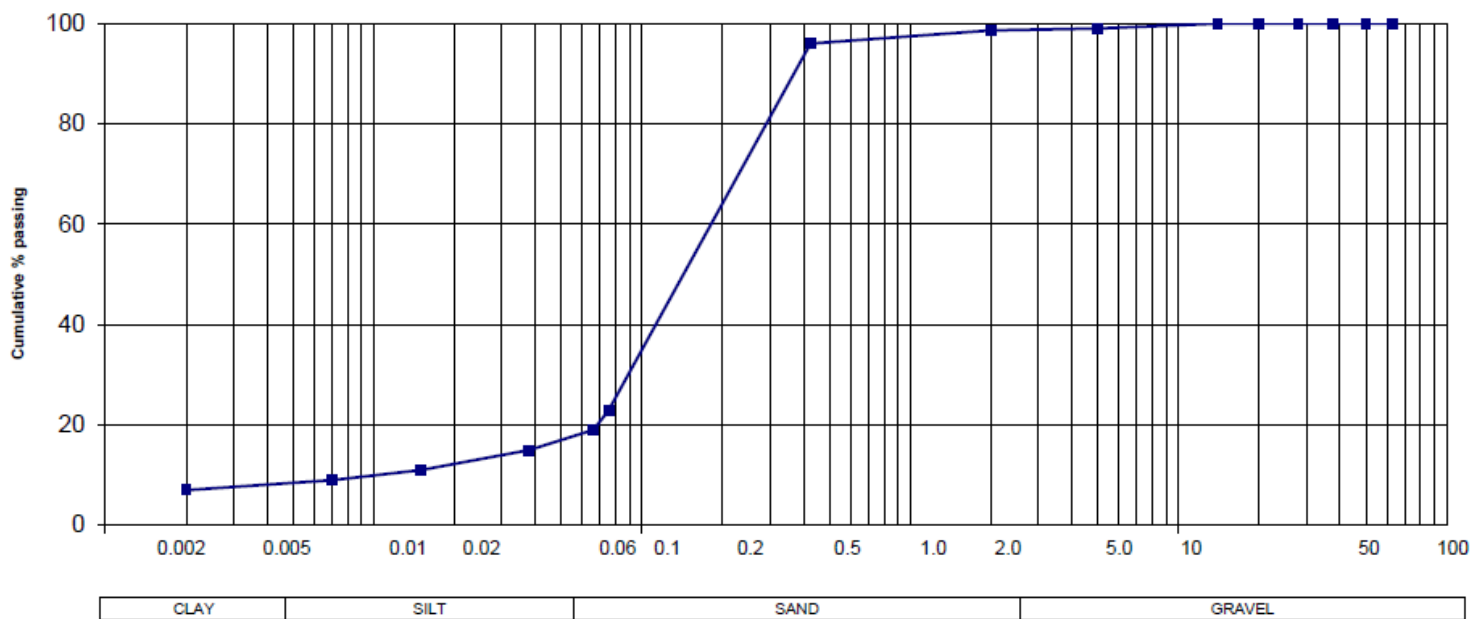
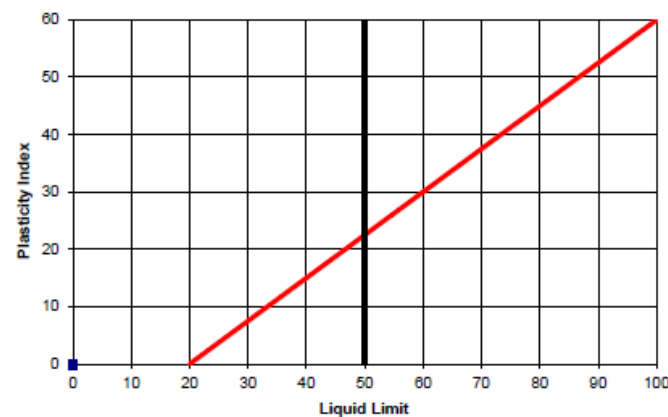
Sample No.	06
Soillab Sample No.	S23-0353-06
Depth (mM)	0.0 - 1.20
Position	TP 10
Material Description	DARK BROWN SILTY SAND
Relative density on < 2 mm (TMH1 A12T)	2.637
Organic Material	
Moisture (%)	
SCREEN ANALYSIS (% PASSING) (SANS 3001:GR1)	
63.0 mm	100
50.0 mm	100
37.5 mm	100
28.0 mm	100
20.0 mm	100
14.0 mm	100
5.0 mm	99
2.00 mm	99
0.425 mm	96
0.075 mm	23
HYDROMETER ANALYSIS (% PASSING) (SANS 3001:GR3)	
66 µm	19
38 µm	15
15 µm	11
7 µm	9
2 µm	7
% Clay	9
% Silt	10
% Sand	80
% Gravel	1
ATTERBERG LIMITS (SANS 3001:GR10)	
Liquid Limit	
Plasticity Index	NP
Linear Shrinkage (%)	0.0
Grading Modulus	0.82
Classification	A-2-4 (0)
Unified Classification	SM
Chart Reference	

PROJECT : PANFONTEIN
JOB No. : S23-0353
DATE : 2023-06-27

POTENTIAL EXPANSIVENESS



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 1971/000112/07

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 Fax: (+27) (12) 481 3941 / 3812
 Email: info@soillab.co.za
 PO Box 72928, Lynnwood Ridge,
 South Africa, 0040

Project Description

Client:	PHATELA GEO -CONSULTING	Soillab Job No.:	S23-0353
Job Description:	PANFONTEIN	Contract Number:	
Date:	2023/06/26	Reference Number:	

Sample Description

Soillab Sample No.:	S23-0353-01	S23-0353-03	
Sample Description:	TP 02	TP 05	
Sample Depth:	0.6 - 2,6	0,8 - 2,8	
Material Description:	DARK YELLOW	DARK YELLOW	

Screen Analysis (% Passing) - SANS 3001-GR1

75,00 mm	100	100	
63,00 mm	100	100	
50,00 mm	100	100	
37,50 mm	100	100	
28,00 mm	100	100	
20,00 mm	100	100	
14,00 mm	98	97	
5,00 mm	87	88	
2,000 mm	84	85	
0,425 mm	82	83	
0,075 mm	37	34	

Soil-mortar percentages - SANS 3001-PR5

Coarse Sand	2.000-0.425mm	2	2	
Coarse Fine Sand	0.425-0.250mm	13	16	
Medium Fine Sand	0.250-0.150mm	23	26	
Fine Fine Sand	0.150-0.075mm	18	17	
Silt and clay	<0.075mm	44	40	

Constants




Grading Modulus	SANS 3001-PR5	0.96	0.98	
Liquid Limit		39	32	
Plasticity Index	SANS 3001-GR10	9	12	
Linear Shrinkage		4.0	4.0	



MOD AASHTO - SANS 3001-GR30



Max Dry Density (kg/m³)	1834	1841	
Optimum Moisture Content (%)	14.5	12.6	

CBR - SANS 3001-GR40

MOULD A			
Moulding Moisture Content (%)	14.7	12.6	
Dry Density (kg/m³)	1838	1847	
Relative Compaction	100.0	100.0	
CBR (%)	3	2	
% Swell	0.5	0.7	
MOULD B			
Dry Density (kg/m³)	1742	1750	
Relative Compaction	94.8	94.7	
CBR (%)	2	1	
% Swell	0.7	0.9	
MOULD C			
Dry Density (kg/m³)	1653	1655	
Relative Compaction	89.9	89.6	
CBR (%)	1	1	
% Swell	1.1	1.3	
CBR (%)			
100% Mod AASHTO	3	2	
98% Mod AASHTO	2	2	
97% Mod AASHTO	2	2	
95% Mod AASHTO	2	1	
93% Mod AASHTO	1	1	
90% Mod AASHTO	1	1	
COLTO Classification:	>G9	>G9	

		W.I. 7.8.1 (a)  T0345
SNA CIVIL AND STRUCTURAL ENGINEERS (PTY) LTD 191 VONKPROP ROAD SAMCORPARK PRETORIA PO Box 72727 Lynnwood Ridge '0040 Tel : (012) 751-9388 E-MAIL : snalab@sna.co.za REG. NO. 2005/006128/07		SANAS accredited facility since 2007
TEST REPORT		
Client :	SOILLAB	REPORT NUMBER 29767
Address:	P.O.BOX 72928 LYNNWOOD RIDGE PRETORIA 0040	
Cell :	716 103 443	
Tel:	012 813 4900	
E-Mail:	choeum@soillab.co.za	
ATTENTION:	MANSHA CHOEU	
Project/Order:	PANFONTEIN / PTA08701	
Brief :	PH & COND	
Date requested	19/06/2023	
Date sampled	SAMPLED BY CLIENT	
Date received	19/06/2023	
Date Tested	Start date : 19/06/2023 End date : 19/06/2023	
Location of sampling	SAMPLED BY CLIENT	
Sampling method/methods	SAMPLED BY CLIENT	
Sampling plan	SAMPLED BY CLIENT	
Sampled by	SAMPLED BY CLIENT	
Sample number	REFER TO TEST REPORT	
Sample Condition/Description	REFER TO TEST REPORT	
Sample classification	N/A	
Sampling Environmental condition	SAMPLED BY CLIENT	
Test Method/Methods used	REFER TO TEST REPORT	
Test done at	SNALAB(PTA)	
Deviation to test methods : Deviations, exclusions or additions will be noted on test result sheets Test/Tests marked # Not SANAS Accredited in this report are not included in the SANAS Schedule of Accreditation for this laboratory. The results relate only to the items tested. Any opinions ,classifications , comments and interpretations do not fall within the scope of our SANAS accreditation. This certificate is issued without any corrections what so ever. Test report/reports shall not be reproduced except in full, without written approval of the Laboratory. This test report relates only to samples received. If the report is referred to as an INTERIM REPORT it is not fit for publication. The only information that will be made publicly accessible will be to Accreditation Body Assessors or Managers who are equally bounded by confidentiality undertakings. Information above noted as " Supplied by Client/Sampled by Client " may effect the validity of the test results.		
 Hendrik Diederiks Pr. Tech Eng Laboratory Manager Technical Signatory		20/06/2023 DATE ISSUED:
		page 1 of 3

	Project	PANFONTEIN			Lab No :	29767
	Rd/Sect/Bp				Client No :	2300
	Layer/ Test pit	S23-0353			Date :	019/06/2023
						W.I.7.8.1(g)i
HOLE & / SAMPLE No.	TP02	TP03	TP07	TP09		
MATERIALS DESCRIPTION	LIGHT YELLOWISH ORANGE SOIL	LIGHT BROWN SANDY SOIL	LIGHT BROWN SANDY SOIL	LIGHT YELLOWISH ORANGE		
DEPTH (m)	0.6-2.6	0-0.9	0-1.10	0.8-2.70		
INDICATORS						
METHODS: SANS 3001-GR 1 + GR2 + GR5	SIEVE mm	% PASSING				
	100.0					
	90.0					
	75.0					
	63.0					
	50.0					
	37.5					
	28.0					
	20.0					
	14.0					
	5.0					
	2.00					
	0.425					
	0.075					
	GM					
SOIL MORTAR ANALYSIS (% vs # mm)						
	2.0 - 0.425					
	0.425 - 0.250					
	0.250 - 0.150					
	0.150 - 0.075					
	<0.075					
ATTERBERG LIMITS (%)						
SANS 3001 GR 10	LL					
	PI					
	LS					
CHEMICAL ANALYSES						
TMH 1: A20	Ph	7.45	5.62	7.56	7.06	
TMH 1: A21T	CONDUCTIVITY (S/m)	0.0097	0.0259	0.0086	0.0108	
MAXIMUM DRY DENSITY AND OPTIMUM MOISTURE CONTENT						
SANS 3001 GR 30	MDD kg/m ³					
	OMC %					
CALIFORNIA BEARING RATIO						
SANS 3001 GR 40	100 % Comp					
	98 % Comp					
	97 % Comp					
	95 % Comp					
	93 % Comp					
	90 % Comp					
	Swell at 100 %					
CLASSIFICATIONS						
AASHTO Classification #		()	()	()	()	
G- Classification #						
Remarks:	The results relate only to the items tested. Any opinions, classifications, comments and interpretations do not fall within the scope of our SANAS accreditation.				Date:	20/06/2023
					Technician:	

	Project	PANFONTEIN		Lab No :	29767
	Rd/Sect/Bp			Client No :	2300
	Layer/ Test pit	S23-0353		Date :	019/06/2023
					W.I.7.8.1(g)i
HOLE & / SAMPLE No.	TP10				
MATERIALS DESCRIPTION	LIGHT GREY SANDY SOIL				
DEPTH (m)	0.1.20				
INDICATORS					
METHODS: SANS 3001-GR 1 + GR2 + GR5	SIEVE mm	% PASSING			
	100.0				
	90.0				
	75.0				
	63.0				
	50.0				
	37.5				
	28.0				
	20.0				
	14.0				
	5.0				
	2.00				
	0.425				
	0.075				
	GM				
SOIL MORTAR ANALYSIS (% vs # mm)					
	2.0 - 0.425				
	0.425 - 0.250				
	0.250 - 0.150				
	0.150 - 0.075				
	<0.075				
ATTERBERG LIMITS (%)					
SANS 3001 GR 10	LL				
	PI				
	LS				
CHEMICAL ANALYSES					
TMH 1: A20	Ph	4.72			
TMH 1: A21T	CONDUCTIVITY (S/m)	0.0346			
MAXIMUM DRY DENSITY AND OPTIMUM MOISTURE CONTENT					
SANS 3001 GR 30	MDD kg/m ³				
	OMC %				
CALIFORNIA BEARING RATIO					
SANS 3001 GR 40	100 % Comp				
	98 % Comp				
	97 % Comp				
	95 % Comp				
	93 % Comp				
	90 % Comp				
	Swell at 100 %				
CLASSIFICATIONS					
AASHTO Classification #					
G- Classification #					
Remarks:	The results relate only to the items tested. Any opinions, classifications, comments and interpretations do not fall within the scope of our SANAS accreditation.			Date:	20/06/2023
				Technician:	

TEST REPORT

S23/0353

For

PHATELA GEOCONSULTING
UNIT 39 LIVINGSTON COMPLEX
EDGAR STREET
NOORDWYK
MIDRAND

Date

2023-06-26

Attention

LIMPHO PHATELA

Your Reference

PANFONTEIN



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Sample(s)	Test(s) Conducted	Date requested	Test Method(s) used	Sampling method & Date	Test(s) done at	Test(s) dates
S23/0353/2	<ul style="list-style-type: none"> Oedometer Test Collapse Potential 	2023-06-20	<ul style="list-style-type: none"> TMH 6 ST 10 TMH 6 ST 10 	Sampling by client	PRETORIA	2023-06-20 2023-06-26
S23/0353/5	<ul style="list-style-type: none"> Oedometer Test Collapse Potential 	2023-06-20	<ul style="list-style-type: none"> TMH 6 ST 10 TMH 6 ST 10 			

Note: **** Decision rule not be applied to the Colto Classification, please enquire if required.
 *** Non-standard aggregate sizes used in test. Generally smaller aggregates will produce lower values and the larger sizes higher values.
 ** Used tap water to wash and not distilled water.
 * Not SANAS Accredited:
 Results marked "Not SANAS Accredited" in this report are not included in the SANAS Schedule of Accreditation for this laboratory / certification body / inspection body.
 Sample and sampling environmental conditions will only be noted if it is abnormal, not according to test method specification or can have an influence on the final result.
 The test results are only applicable to the samples tested.

I accept this document
Miss EB Lefoka
Technical Signatory (Geolab)

The results relate only to the items tested.
Opinions and interpretations expressed herein are outside the scope of SANAS accreditation.
Refer to the Scope of Accreditation for details regarding the technical signatories.
This test report shall not be reproduced except in full, without written approval of the laboratory.

Oedometer

TMH 6 ST10

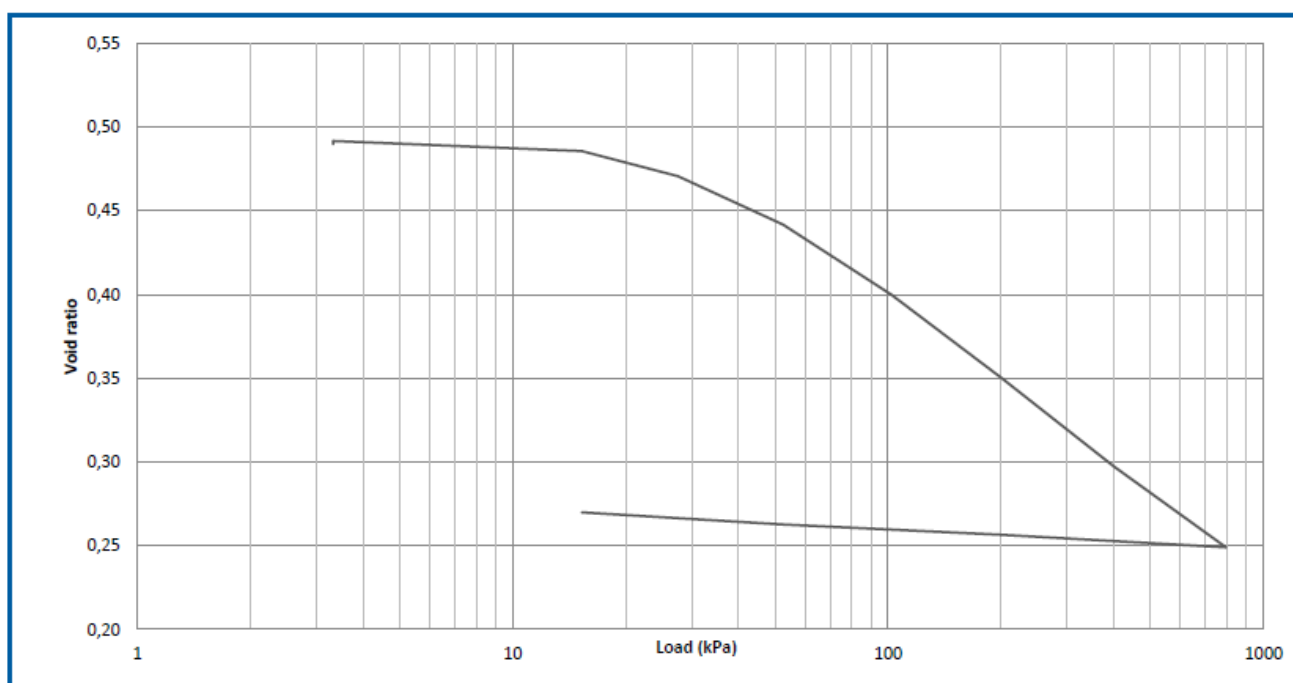
Project:	PANFONTEIN
Client:	Phatela Geoconsulting
Geolab Job Nr:	S23-0353
Test Method:	TMH 6 ST10

Sample Nr:	TP05
Sample Depth:	0.8-2.8
Date:	2023/06/26

Load kPa	Height mm	Void Ratio	m_v MPa ⁻¹
3,3	19,380	0,490	
3,3	19,404	0,492	
15,3	19,326	0,486	0,336
27,6	19,13	0,471	0,825
52,5	18,754	0,442	0,789
101,9	18,21	0,400	0,586
200,6	17,564	0,350	0,360
399,5	16,876	0,297	0,197
795,0	16,248	0,249	0,094
200,6	16,346	0,257	
52,5	16,426	0,263	
15,3	16,52	0,270	

Sampling Method:	Bag
Disturbed/Undist:	Disturbed
Remoulded To:	-

	Initial	Final	
Sample Height:	19,38	16,52	mm
Sample Mass:	115,38	115,60	g
Dry Density:	1756	2060	kg/m ³
Density:	1977	2324	kg/m ³
Moisture Content:	12,6	12,8	%
Void Ratio:	0,490	0,270	
Specific Gravity:	2,616		Mg/m ³



* - m_v values provided are incremental and only valid for the specific load increment.



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R98 version 1

Oedometer

TMH 6 ST10

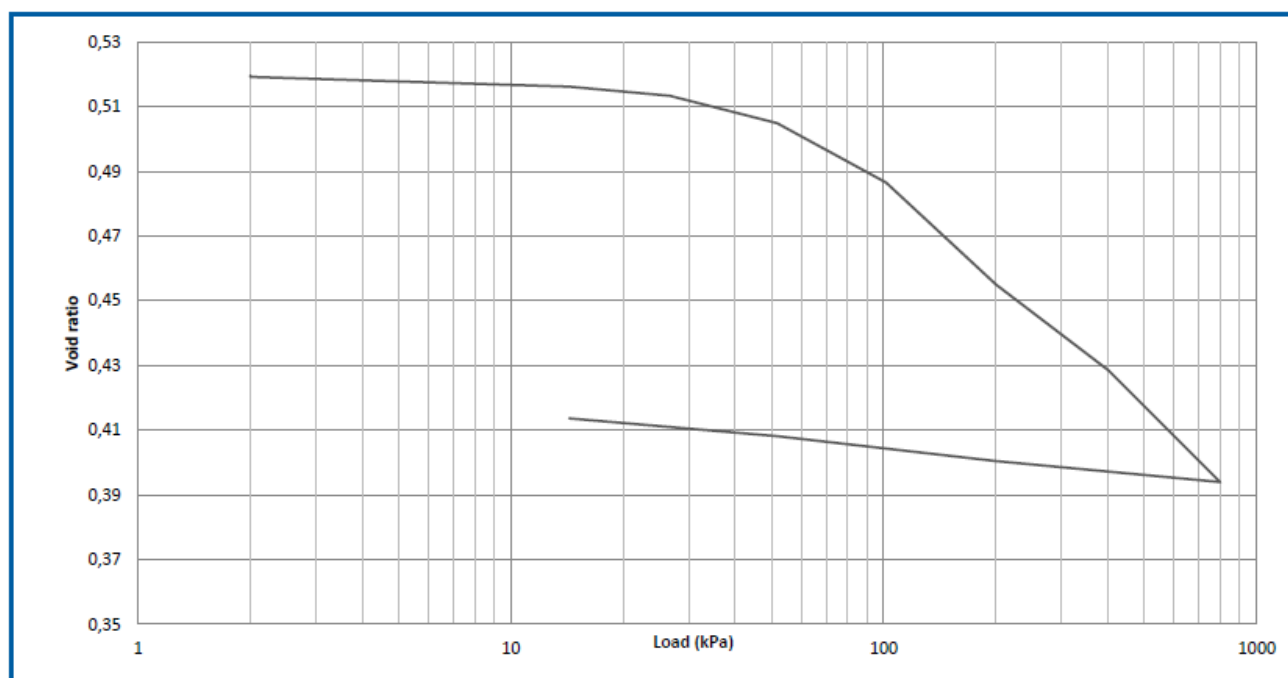
Project:	PANFONTEIN
Client:	Phatela Geoconsulting
Geolab Job Nr:	S23-0353
Test Method:	TMH 6 ST10

Sample Nr:	TP02
Sample Depth:	0.6-2.6
Date:	2023/06/26

Load kPa	Height mm	Void Ratio	m_v MPa ⁻¹
2,0	19,620	0,520	
2,0	19,614	0,519	
14,3	19,575	0,516	0,161
26,7	19,539	0,513	0,149
51,7	19,429	0,505	0,225
101,4	19,192	0,487	0,245
200,2	18,785	0,455	0,215
399,1	18,445	0,429	0,091
798,9	17,997	0,394	0,061
200,2	18,081	0,400	
51,7	18,18	0,408	
14,3	18,251	0,414	

Sampling Method:	Bag
Disturbed/Undist:	Disturbed
Remoulded To:	-

	Initial	Final	
Sample Height:	19,62	18,25	mm
Sample Mass:	116,04	119,07	g
Dry Density:	1724	1853	kg/m ³
Density:	1974	2177	kg/m ³
Moisture Content:	14,5	17,5	%
Void Ratio:	0,520	0,414	
Specific Gravity:	2,619		Mg/m ³



* - m_v values provided are incremental and only valid for the specific load increment.



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R98 version 1

Collapse Potential

Project:	PANFONTEIN
Client:	Phatela Geoconsulting
Geolab Job Nr:	S23-0353
Test Method:	TMH 6 ST10

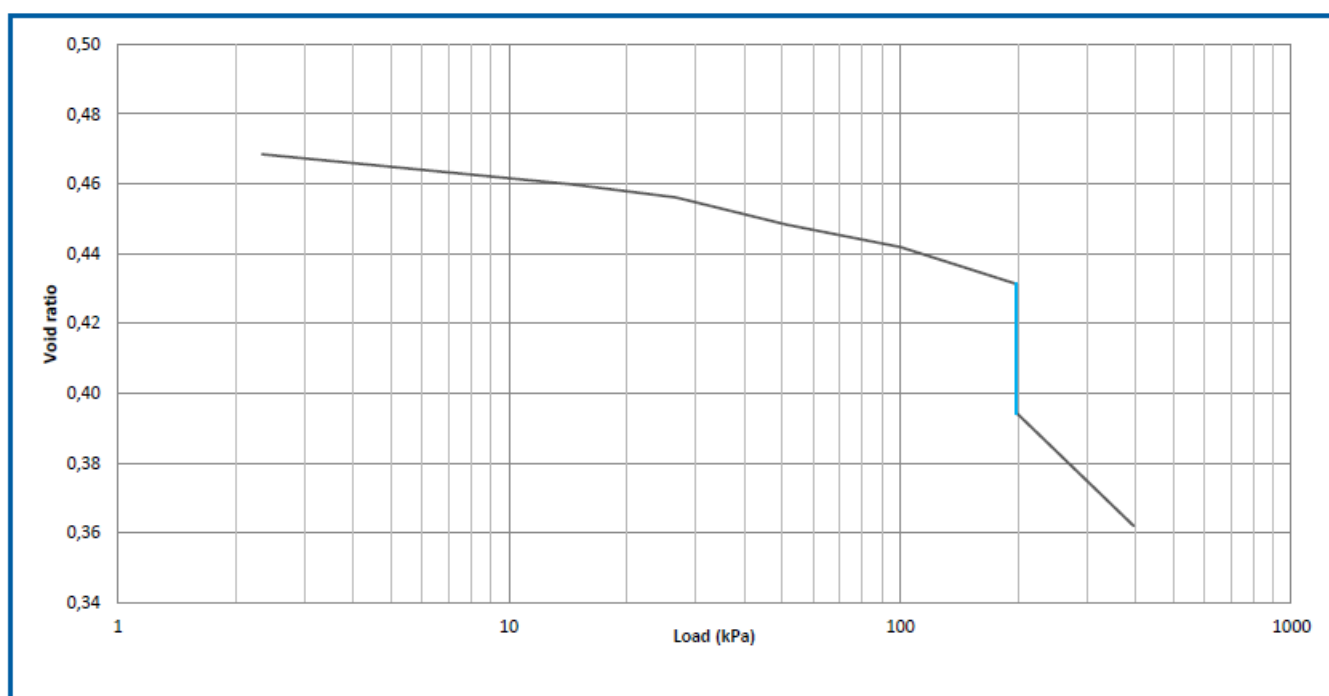
Sample Nr:	TP05
Sample Depth:	0.8-2.8
Date:	2023/06/26

Results	
Collapse Potential:	2,5 %

Sampling Method:	Bag
Disturbed/Undist:	Disturbed
Remoulded To:	NA

Load kPa	Height mm	Void Ratio
2,3	19,52	0,468
14,4	19,406	0,460
26,7	19,356	0,456
51,1	19,252	0,448
100,3	19,166	0,442
198,5	19,026	0,431
198,5	18,534	0,394
395,4	18,104	0,362

	Initial	Final	
Sample Height:	19,52	18,10	mm
Sample Mass:	117,1	119,8	g
Dry Density:	1781	1921	kg/m ³
Density:	2006	2211	kg/m ³
Moisture Content:	12,6	15,1	%
Void Ratio:	0,468	0,362	
Specific Gravity:	2,616		Mg/m ³



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R108 Rev 1

Collapse Potential

Project:	PANFONTEIN
Client:	Phatela Geoconsulting
Geolab Job Nr:	S23-0353
Test Method:	TMH 6 ST10

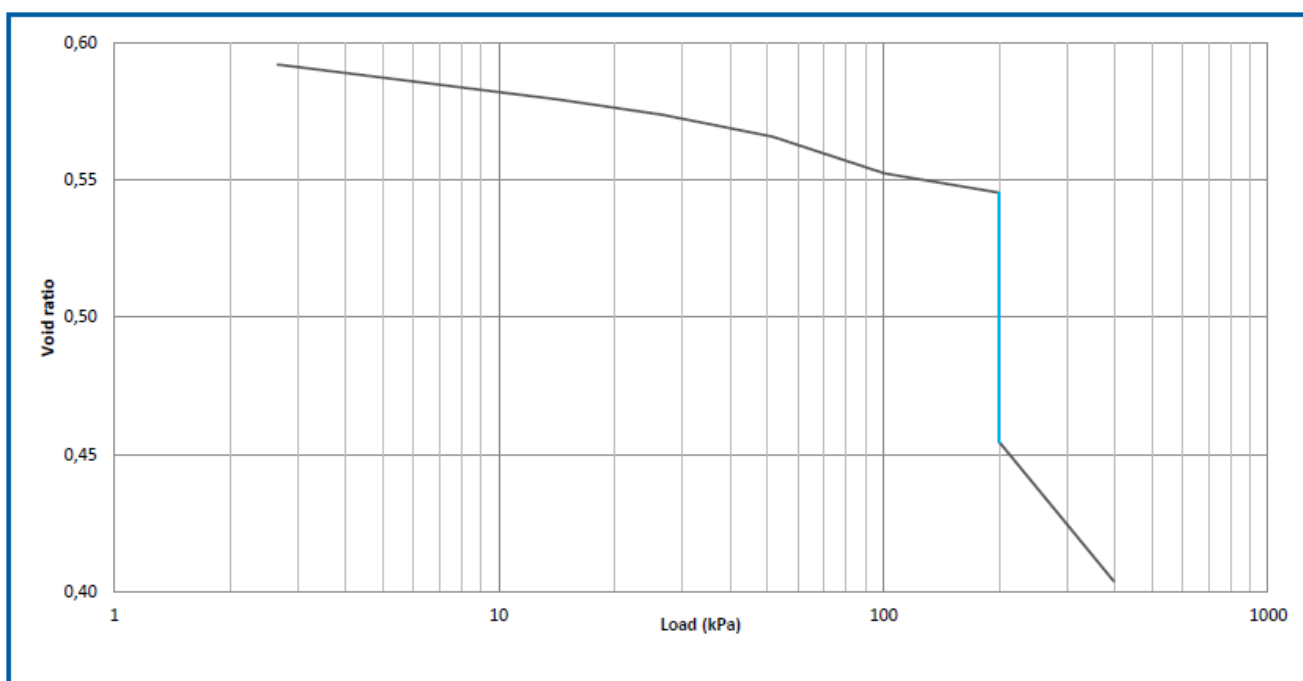
Sample Nr:	TP02
Sample Depth:	0.6-2.6
Date:	2023/06/26

Results	
Collapse Potential:	5,7 %

Sampling Method:	Bag
Disturbed/Undist:	Disturbed
Remoulded To:	NA

Load kPa	Height mm	Void Ratio
2,7	20	0,592
14,3	19,84	0,579
26,6	19,77	0,574
51,5	19,67	0,566
100,7	19,502	0,552
199,8	19,413	0,545
199,8	18,273	0,455
397,2	17,634	0,404

	Initial	Final	
Sample Height:	20,00	17,63	mm
Sample Mass:	113,3	115,7	g
Dry Density:	1645	1866	kg/m ³
Density:	1884	2181	kg/m ³
Moisture Content:	14,5	16,9	%
Void Ratio:	0,592	0,404	
Specific Gravity:	2,619		Mg/m ³



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R108 Rev 1



WATERLAB (Pty) Ltd
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 Persekor Techno Park Persekor Park, 0020
 Meiring Naudé Drive Tel: +2712 – 349 – 1066
 Pretoria Fax: +2712 – 349 – 2064
 e-mail: admin@waterlab.co.za



**CERTIFICATE OF ANALYSES
 BASSON INDEX**

Date received: 2023-06-29 Date completed: 2023-07-03
 Project number: 1000 Report number: 121285 Order number:

Client name: Phatela Geo Consulting Contact person: Limpho Phatela
 Address: Unit 39, Livingstone Complex, 6th Road, Noordwyk, Email: lphatela@gmail.com
 Midrand, 1687 Cell: 072 587 4271
 Telephone: ---

Analyses in mg/ℓ (Unless specified otherwise)	Method Identification	Sample Identification:	
		TP6 0-0.7m	TP5 0.8-2.8
Sample Number		23-9494	23-9495
Leachate used	WLAB075	Distilled Water	Distilled Water
Mass Used (g)	---	500	500
Volume Used (mℓ)	---	1000	1000
pH Value at 25°C	WLAB001	7.7	6.0
pHs Value at 20°C (calc)	WLAB053b	8.7	9.1
Electrical Conductivity in mS/m at 25°C	WLAB002	16.5	10.4
Total Dissolved Solids (calc)	WLAB068	111	70
Total Alkalinity as CaCO ₃	WLAB007	52	<5
Total Hardness as CaCO ₃ (calc)	WLAB051b	69	188
Calcium Hardness as CaCO ₃ (calc)	WLAB051a	40	180
Calcium as Ca	WLAB015	16	2
Magnesium as Mg	WLAB015	7	2
Free & Saline Ammonia	WLAB046	0.5	<0.1
Ammonium as NH ₄ (calc)	WLAB068	0.6	<0.3
Sulphate as SO ₄	WLAB046	2	14
Chloride as Cl	WLAB046	4	2
Langelier Index at 20°C (calc)	WLAB053c	-1.0	-3.1
Ryznar Index at 20°C (calc)	WLAB053d	9.6	12.2
Corrosivity Ratio (calc)	WLAB054	0.1	4.4
Leaching Index [LCSI] (calc)*	---	1105	2544
Spalling Index [SCSI] (calc)*	---	4	2
Aggressiveness Index [N _c] (calc)*	---	1109	2546

Please note:
 - The blank is subtracted from all leach results, except pH and Electrical Conductivity.
 - * = Not SANAS Accredited
 - Tests marked "Not SANAS Accredited" in this report are not included in the SANAS Schedule of Accreditation for this Laboratory.
 - [o] = Analyses performed by an Outsourced Laboratory
 - Results marked "Outsourced Test" in this report are not included in the SANAS Schedule of Accreditation for this Laboratory

S. Laubscher
 Technical Signatory

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T0391

CERTIFICATE OF ANALYSES
BASSON INDEX

Date received: 2023-06-29
Project number: 1000

Report number: 121285

Date completed: 2023-07-03
Order number:

Client name: Phatela Geo Consulting
Address: Unit 39, Livingstone Complex, 6th Road, Noordwyk,
Midrand, 1687
Telephone: ---

Contact person: Limpho Phatela
Email: lphatela@gmail.com
Cell: 072 587 4271

Important notes (see table for corrections on p.4):

1. The above aggressiveness index is only applicable for conditions of laminar flow at a mean annual temperature of 20°C.
2. For stagnant/turbulent conditions the aggressiveness index must be corrected.
3. For wet/dry cycling conditions (for example in tidal zones) the aggressiveness index must be corrected.
4. For mean annual temperatures lower/higher than 20°C the aggressiveness index must be corrected.

S. Laubscher

Technical Signatory

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**CERTIFICATE OF ANALYSES
 BASSON INDEX**

Date received: 2023-06-29 Date completed: 2023-07-03
 Project number: 1000 Report number: 121285 Order number:

Client name: Phatela Geo Consulting Contact person: Limphe Phatela
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 Midrand, 1687 Cell: 072 587 4271
 Telephone: ---

Guidelines for assessing overall aggressiveness (N_c):

N _c	Aggressiveness
Not greater than 300	None to mild
400-700	Mild to moderate
800-1000	High
= or > 1 100	Very high

Aggressiveness Towards Concrete and Fibre Cement Pipes			
Index	Aggressive	Neutral	Non- Aggressive
a) Stability pH (pHs)	> pH	= pH	<pH
b) Langelier Index	Neg. Value	Zero	Pos. Value
c) Ryznar Index	>7.5	6-7	<6

Corrosiveness Towards metals	
Corrosivity	>0.2

Sample Name	Sample Number	Corrosivity Indices	Basson Index
TP6 0-0.7m	23-9494	Non-Corrosive	Aggressive
TP5 0.8-2.8	23-9495	Corrosive	Aggressive

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To correct for:	Multiply	By: (see Notes 2 to 5 below)
Turbulence	LCSI	1.75
Stagnance	LCSI	0.5
Temperature	LCSI, SCSI, N7 Where N7=0.2 x Cl in mg/l	(1+ [0.05 x (T-20)])
Wet-dry cycles	SCSI	0.23 x 10 ⁻⁶ x TDS x DTF x CPA Where: DTF = Dry Time Fraction CPA = wet-dry cycles per annum

Note 1: Only if the concrete contains embedded steel.
Note 2: To preserve the correct logical relationships when dealing with the negative sub-indices (i.e. LCSI or SCSI having minus values) they should be multiplied by the reciprocal of the relevant factor indicated in this column
Note 3: If more than one correction is required, multiply by the product of the individual correction factors
Note 4: Use subscript c to indicate that the index has been corrected, e.g. for turbulent conditions LCSI_c = LCSI x 1.75
Note 5: Round off corrected indices to the nearest 100.

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