Lanseria Extension 81
(Ptn of Ptn 2 of the Farm Bultfontein 533-IQ)

GEOTECHNICAL INVESTIGATION REPORT

REPORT NO: GGE/24009

June 2024

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List of Abbreviations

BGL - Below ground level
BH - Borehole (& No)
COP - Code of Practice = SANS 1936 : 2012
DAD - Dolomite Area Designation
DC - Dynamic Compaction
DR - Dynamic Replacement
DRMP - Dolomite Risk Management Plan
DWAF - Department of Water Affairs & Forestry
IHC - Inherent Hazard (Risk) Class
NGL - Natural ground level
RIC - Rapid Impact Compaction
SANS - South African National Standard - SANS 1936 : 2012 - Development of Dolomite Land
SDP - Site Development Plan
TP - Test Pit (& No)

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Project Title	**Geotechnical Investigation for the Proposed Township fo Lanseria Extension 81**		
Client	**HireAll**	For Attention	Mr Craig Murchie
Project Number	GGE/24009	Date	10 June 2024

1. Introduction and Terms of Reference

Geoid Geotechnical Engineers (GGE) have been appointed by Mr Craig Murchie, HireAll, to carry out a geotechnical investigation for the proposed development of Lanseria Extension 81 situated on *Portion of Portion 2 of the farm Bultfontein 533-IQ*. The approved cost proposal GGE/P24007 of 10th April 2024 has reference.

This investigation was carried out according to the *Guidelines for Urban Engineering Geological Investigations,* as published by the *South African Institute of Engineering Geologists* and *South African Institution of Civil Engineers.*

2. Information Supplied

The following documents and drawings were provided for this investigation by Mr Craig Murchie for consideration:

(a) Lanseria Ext 81 - Township Layout Plan FINAL 16.04.2024.pdf
(b) Plan 1 TPH.dwg
(c) 16.04.2024 Conditions of Establishment Lanseria Extension 81.docx

This information was overlaid on the available aerial imagery retrieved from the City of Joburg GIS.

3. Scope of Work

The scope of work covered in this appointment comprised the following components:

(a) GIS modelling of regional topographic and geological setting for contextual site classification purposes (see Figures 1-2 - Appendix A).

(b) Consolidation of all existing information from prior investigations in the area, so as to provide an optimised fieldwork distribution (see Figure 3, Appendix A), incorporating any useful information from prior work.

(c) Near surface investigative fieldwork, comprising the in situ profiling of a grid of test pits covering the footprint of the proposed township (see Appendix C).

(d) Supplementary probing of the ground profile by means of DCP techniques, typically from ground level adjacent to test pits, which are provided as material strength overlays on the test pit profiles (see Appendix C).

(e) Soil laboratory testing for foundation and materials assessment (Appendix D).

(f) Data synthesis and analysis.

(g) Formal geotechnical report, comprising factual and interpretive components.

4. Investigation Objectives

The objectives of this project were limited to the following:

(a) to determine the general nature, distribution and engineering properties of the near surface soils and underlying rocks across the footprint of the proposed development;

(b) to provide a geotechnical classification of the site according to the guidelines referred to above;

(c) to give general foundation recommendations for the anticipated light-industrial structures;

(d) to classify the excavation characteristics for buried services, foundations and near-surface soil retention;

(e) to appraise any groundwater conditions which may impact on any foundations / excavations;

(f) to assess the slope stability of the project site;

(g) to comment provisionally on the properties of available soils for reuse;

(h) to comment on any other geotechnical issues warranting attention.

5. Background Information

The findings of the following historical geotechnical reports have been synthesised and included in this investigation:

(a) Geoid Geotechnical Engineers (Pty) Ltd (April 2018), ***Geotechnical Investigation Report for Portion 72 of the Farm Bultfontein 533-IQ***, Report No: **GGE/18005** for HireAll.

(b) Geoid Geotechnical Engineers (Pty) Ltd (January 2020)***, Geotechnical Investigation Report for Portion 32 and Remainder of Portion 1 Botesdal 529-JQ***, Report No: GGE/19040 for EDS Africa Consulting.

(c) Geoid Geotechnical Engineers (Pty) Ltd (April 2024), ***Geotechnical Investigation Report for Lanseria International Airport, Proposed Expansion Project Southern Precinct,*** Report No: **GGE/23031/2** for EDS Africa Consulting.

6. Site Location and Description

Lanseria Extension 81 - with a combined area of approximately 31ha - comprises the largely vacant, wedge-shaped parcel, described as Portion of Portion 2, Bultfontein 533-IQ, which abut the adjacent Lanseria industrial park on the north and stretches from Malibongwe Drive in the west through to Holding 6, Sunrella in the east (Figures 1, 3 - Appendix A).

The project site is subdivided into 21 separate erven, numbered 954 - 974, of which Erven 956 and 974 are already utilised as the main warehouse and plant yard of the HireAll heavy plant division at Lanseria (see Figure 3 - Appendix A).

The remaining erven are presently undeveloped, virgin parcels, with the exception of:

(a) a small quarry on Erf 973 (see Figure 4 - Appendix A),

(b) loose stockpiles of spoils - possibly derived from the quarry - which are predominantly placed on the adjacent Erf 972, but spill over onto Erf 971, 978 and 959 (see Figure 4 - Appendix A).

City of Joburg mapping - based on the 2015 LIDAR survey - provides 2m contour details from which the site can be seen to be rising from the R512 in the west, to the hillcrest parallel with the reservoir and water tower on the adjacent plot, Portion 161 / 533-IQ, whereafter it falls in an easterly direction towards the airport taxiway (see Figure 3, Appendix A).

The average natural slope west of the hillcrest is approximately 1:18 (5.6% or 3.2°), with a more gentle slope east of the hillcrest at approximately 1:22.5 (4.4% or 2.5°).

At the time of the investigation, the vegetation on the site consisted predominantly of veld grass, with very limited bush dotted around the prominent rock outcrop passing through Erven 971 / 972, and colonising the aforementioned material stockpiles on the stands surrounding the quarry (Figure 4, Appendix A).

The lowermost 1.5ha of the site is affected by a drainage line and small wetland which is buffered by others and presented as an overlay in Figure 4, where development will be precluded.

In addition to the prominent outcropping ridge exposed on Erven 971 / 972, sporadic boulder/rock outcrop is littered throughout the surface of much of the lower half of the western slope of the site.

An overall depiction of the present state of the site is shown in the image sequence below:

View of eastern slope - which is largely featureless grassland without any outcrop

View of western slope - with evidence of scattered boulders at ground surface

View of quarry on Erf 973, exposing bouldery residual diabase throughout most of the perimeter, with granite outcrop in the south-west

Extensive material stockpiles, presumably taken from the adjacent quarry, masking the natural profile - which is presumed to be a combination of diabase and granite, with sporadic rock outcrop

7. Nature of the Investigation

This investigation is based on a desk study to collate and synthesize all existing information, followed by a formal fieldwork programme comprising the profiling of shallow test pits and DCP probing, supplemented with soils laboratory testing, all in accordance with industry norms.

7.1 Test Pit Profiling

The primary fieldwork component of this investigation comprised the in situ, visual and tactile profiling of 27 test pits / cutting profiles (TP01-TP27) by a registered professional geotechnical engineer, using industry-standard methodology.[1]

The dataset references the findings of our prior investigations where the test pits lie in close proximity and provide useful supplementary geotechnical information to guide zone boundary delineation (see Figure 4, Appendix A).

The test pits were pre-planned on a triangulated grid maintained from our prior investigation for the Lanseria Airport Expansion project, the result of which is near-optimal coverage of the site at a reasonable resolution so as to expose the range of geotechnical conditions present on this site.

Test positions were set out using a hand-held Garmin GPS - typically accurate to ~2m, with several of the proposed positions not being accessible on the pre-planned position, mainly due to material stockpiles and the inaccessible quarry.

Test pits were excavated between 6th-7th May 2024, by a JCB.3CX TLB supplied by HireAll Lanseria, to the limit of reach (approximately 2.5m-3.0m) or refusal on competent soil/rock quality material.

Profile plots - which graphically represent the soil profile in the test pits - are presented in Appendix C.

1 Brink, ABA, and Bruin, RMH (2002) ***Guidelines for Soil and Rock Logging in South Africa***, Proceedings, Geoterminology Workshop organized by AEG, SAICE, and SAIEG, 1990.

7.2 DCP Probing

A set of supplementary dynamic cone penetration (DCP) tests were performed from ground surface to nominally 2m depth or prior refusal where this was not possible, at all of the GGE test pit positions shown on Figure 3 (Appendix A).

These DCP probes provide:

(i) an *indicative in situ soil consistency* from the crest of the test pits to a maximum depth of 2m below the probing surface;

(ii) an in situ CBR[2] of the soils, which is, importantly, highly dependent on the in situ moisture regime at the time of the test;

(iii) a preliminary in situ field assessment of the engineering properties of the soil horizons penetrated;

(iv) the rational basis upon which to *infer the soil profile* where this may not be physically observed, in the absence of any test pits being accessible.

These probe traces are presented graphically as a *Design Equivalent Material Class*, based on penetration rate ranges specified in the South African Pavement Engineering Manual[3], and overlaid on the soil profiles in Appendix C.

7.3 Laboratory Testing

Selected soil samples retrieved at the time of profiling were submitted for laboratory testing for foundation engineering analysis. Copies of these laboratory tests are included in Appendix D and a summary thereof which is presented in Table 1 (Appendix B).

The tests undertaken include the following:

(i) Grading and Atterberg Limit tests to determine the basic engineering properties of the in situ soils for classification purposes.

(ii) Natural moisture content tests to determine the in situ moisture regime.

(iii) One-dimensional consolidometer (oedometer) tests - under *saturated conditions* - on the soil horizons likely to be stressed by the structural loads - to assess their stress-strain behaviour from which to predict the settlement and allowable bearing pressures for their foundations.

(iv) Moisture-density tests at Mod-AASHTO compactive effort and California Bearing Ratio (CBR) tests to determine the compaction characteristics and classification of the in situ materials for the purpose of both road pavement and earth terrace / soil mattress design.

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2 **California Bearing Ratio (CBR)** - a penetration test for the evaluation of the mechanical strength of road subgrades, or as a measure of the load-bearing capacity of soils used for building roads, which can also be used for measuring the load-bearing capacity of unimproved airstrips or for soils under paved airstrips. The harder the surface, the higher the CBR rating. Characteristically a CBR of 3 equates to tilled farmland comprising poor-quality fines-dominant soils, while high quality compacted crushed rock aggregate has a CBR of 100.

3 South African National Roads Agency Ltd (January 2013): ***South African Pavement Engineering Manual Revision 1.0, Chapter 9: Materials Utilisation and Design, Section 15.4 Determining the Material Class, Table 32 - DCP Criteria for Granular Materials.***

8. Geology and Soil Profile

8.1 Regional Geology

Available regional geological mapping [4] shows the project site to be principally underlain by **granite** (migmatites, banded gneisses, mafic and ultra-mafic xenoliths, homogeneous and porphyritic grano-diorite phases with prominent pegmatite veining) of the Halfway House Granite formation (Johannesburg-Pretoria granite inlier [5]) of the Basement Complex - see Figure 2 (Appendix A).

The geological mapping is fairly complex in the immediate vicinity of the site, showing it to be directly impacted by both a fault line (crush zone) and several mafic (**diabase**) **intrusions** passing through the otherwise granitic setting.

Intrusions of this nature are typically mapped off aerial photographs on the basis of visible rock outcrop, which is very common in these intrusive rocks. At the scale of the mapping, the position of the intrusions may be somewhat imprecise, necessitating more detailed investigation to establish their lateral extent (see Figures 2&4, Appendix A).

8.2 Local Soil Profile

The profile observed in the test pits *confirms the regional geological mapping for the project site*, exposing a fairly typical *residual granite profile with several intrusions of residual diabase and exposure of the aforementioned fault line* passing through the south-western third of the site.

Given these observations, it is our assessment that **eight geotechnical zones** are warranted for this site, the *tentative boundaries* of which are presented in Figure 4 (Appendix A) based on the material exposed in the test pits, aerial photo interpretation including vegetation of the site. Notwithstanding the eight geotechnical zones, the site is essentially characterised by variations of the following two soil profiles:

8.2.1 Predominantly Residual Granite

(i) **Hillwash**
Dry to slightly moist, brown, medium dense, porous, silty sand.

(ii) **Pebble Marker**
Dry though moist, reddish-orange blotched brown, medium dense, porous, silty sand, with abundant sub-rounded quartz gravels and cobbles becoming highly ferruginous in an easterly direction.

(iii) **Variably Altered Reworked Residual Granite**
Slightly moist, reddish-orange blotched dusky-red and brown, medium dense, porous, clayey sand, with intermittent quartz veins

(iv) **Residual Granite**
Slightly moist, olive-green through pale orange, pale yellow or dusky-red, medium dense to dense, intact and relict-structured, silty sand.

4 Department of Mines (1973), **1:50,000 Geological Series, *2527DD Broederstroom,*** Geological Survey.

5 An ***inlier*** is an area of older rocks surrounded by younger rocks. Conversely an ***outlier*** is an area of younger rock completely surrounded by older rocks

8.2.2 Locally Residual Diabase

Several subordinate enclaves / lineations of intrusive diabase material were encountered within the overall granitic soil / rock mass, consistent with the mapping, which shows at least two intrusions passing through the site (Figures 2&4, Appendix A).

(i) **Hillwash / Gullywash**
Slightly moist to moist, dark greyish-brown, loose, porous, clayey silty sand with roots.

(ii) **Reworked Residual Diabase**
Slightly moist through very moist, beige mottled grey and reddish-orange, soft, partially intact and relict-structured, clayey silt.

This soil horizon was found to be relatively thick in the vicinity of the quarry - possibly due to impeded groundwater flow - where its base depth was not proven, and the profile contains a signficant volume of small, spheroidally weathered, diabase boulders.

(iii) **Residual Diabase**
Pale pink speckled black and dark green, evidently fissile, silty sand through very soft rock.

Reference should be made to the appended profiles for detailed descriptions of the in situ soils encountered during the investigation (Appendix C), the depths of which are summarised in Table 2 (Appendix B).

8.3 Rock Profile

Shallow bedrock of very soft through soft rock quality is found to be fairly prevalent in the western slope of the site - as highlighted in Zone 3 (Figure 4, Appendix A), occurring within both the granite (photos overleaf) and the diabase zones.

Within the granite, the rockhead is more massive and shallow than the diabase, where the latter it tends to be more deeply weathered and bouldery in nature.

A very prominent quartz vein outcrops as an elevated ridge in the general vicinity of TP10 (shown overleaf), roughly parallel with the mapped diabase intrusion. This is characteristic of crustal movement associated with the fault line mapped on Figure 2. From photographic evidence of the profile in the quarry, it appears that the quartz veins are non-continuous, and may prove to be more readily excavatable than is initially apparent.

Observed erratic refusal depths, as reflected on Table 1 (Appendix B), are indicative of a highly undulating rockhead, which is characteristic of this igneous geology.

8.4 Groundwater

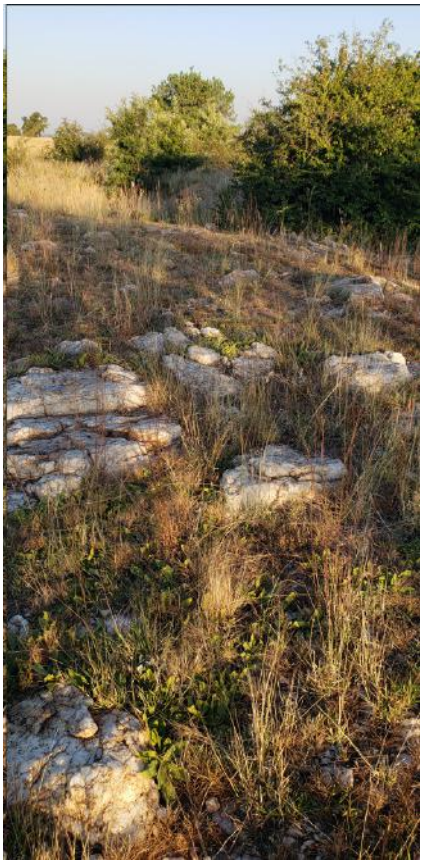
A shallow groundwater table was encountered in two of the seven test pits from the previous investigation for the present Hire All warehouse - TP113 and TP114 - located in the low-lying basin comprising Zone 2 - from depths in the order of 0.5m below ground level. Although this was not found in the present investigation, the soil profile is commonly leached in the reworked residual granite zone, indicative of shallow groundwater.

Moreover, the presence of highly competent, very shallow, near-hardpan ferricrete beneath the eastern slope is characteristic of an intermittent shallow perched water table in Zone 4, in particular.

Any areas of the site characterised by vlei vegetation - typical of that found in Zone 8, which generally grows in partial to waterlogged soils - is indicative of widespread shallow groundwater.

Shallow pegmatite-rich granite rockhead exposed in TP04

Exposed granite sub-outcrop in the quarry at TP06



Quartz rock outcrop in the vicinity of TP10

Quartz boulders exposed in the transported zone of the profile, above the residual diabase of TP07, suggest that these may be more discrete than is apparent from ground surface observations at TP10.

9. Geotechnical Assessment of the Project Site

The geotechnical assessment which follows represents a *professional interpretation of the factual information* collated from our current and previous investigations. These comments are intended to guide the overall master plan for the development of this site, including preliminary design and costing of appropriate solutions for bulk excavations, cut slopes, ground improvements, earth fill using available materials usage and indicative founding of future industrial structures, the details of which are presently unknown. These are subject to further consideration of the site development plan and/or bulk excavation levels, which were yet to be finalised at the time of this report being drafted.

It is considered sound engineering practice for the investigating Geotechnical Specialist to be included in the project team so as to have further input - and be given opportunity to review final development plans and design details in regard to all the ground-related issues covered in this report - in order to verify the appropriateness of decision-making on the construction methodology and specifications, and to provide important continuity from investigation / initial interpretation phase through to detailed design and construction.

The following issues of importance should be borne in mind during the detailed design process in respect of foundations and earthworks:

(a) the soil profiles presented in this report provide an *initial guide* (or characteristic) to the generally expected ground conditions, given the appropriately wide grid spacing used for this general investigation;

(b) within the relatively coarse grid, it is completely normal for ground profile variations to be present between points of inspection;

(c) notable changes should be anticipated across all geological interfaces - such as are present on this site - which will give rise to the need for *informed geotechnical judgment* in applying the design recommendations;

(d) these investigation findings should be verified by the geotechnical specialist once the site is opened up for construction, or where significantly-modified earthworks and construction are proposed, in order that ground variances are properly interpreted and construction recommendations appropriately revised, where necessary.

9.2 Geotechnical Classification

The geotechnical site classification system used provides a first-order appraisal of the project site from a ground engineering perspective, to illustrate the impact of the ground profile on light masonry structures which typically characterise many developments. On the basis of our field profiling, we are of the opinion that the project site is characterised by the following **eight broad geotechnical designations**, the inferred boundaries of which are depicted on Figure 4 (Appendix A), with terms defined in Appendix E:

9.2.1 Zone 1: 2 [C1-C2]

The profile in this zone comprises the more general **granitic material** which is moderately deeply reworked and blanketed by transported hillwash and colluvial gravels of variable thickness. The residual granite horizon is generally not well developed, typically grading into rock within the upper 2.5m - 3.0m of the profile. From a behavioural perspective, the residual soils are **compressible / potentially slightly collapsible**, but blanketed by potentially **highly collapsible transported soils**. This is a favourable zone for development, with the primary challenge being the inconsistent depth to an appropriate founding horizon.

9.2.2 Zone 2: 2 [H1-H2 / locally R (boulder sub-outcrop)]

This profile comprises several lineations / enclaves of potentially **slightly to moderately expansive** reworked **residual diabase** soils - which may **become active** in the event of drying out during earthworks operations / trenching. The diabase is typically weathered to a much greater depth than the granite, and prone to the formation of hard corestones within the clayey soil matrix. This zone is considered sub-optimal for structural and earthworks development, with more expensive foundations and earthworks, given the general need to spoil the residual materials which are unsuitable for earthworks applications.

9.2.3 Zone 3: 2-3 [C-C1 / H1-H2 / R (outcrop / sub-outcrop)]

The zone is a variation on Zones 1 and 2 (where the boundary between the zones is masked by fill deposits), exhibiting **significant outcrop / boulder outcrop and sub-outcrop** which appears to be limited to the western slope of the site below the prominent rock outcrop associated with the shear zone in the vicinity of TP10. The exposed cutting in the quarry zone suggests that much of the outcrop in this zone may be superficial bouldery material, which may prove to be less onerous to deal with than is at first apparent. In its current state, however, this is considered an *unfavourable zone* from a development perspective, potentially necessitating costly preparatory earthworks to first deal with the rocky surface.

9.2.4 Zone 4: 2 [C1-C2 / R (ferricrete sub-outcrop)]

The zone is assumed to be largely underlain granitic material at depth, but blanketed by a particularly competent, shallow ferricrete horizon which appears to persist throughout this zone at relatively modest depths. The apparent competence of the ferricrete is verified in the TLB and DCP refusal in all of these test pit positions without providing the nature of the underlying residual soils, which represents a risk of uncertainty. At the adjacent Lanseria site, the ferricrete was found to be between 0.6m-0.9m thick, provided a substantial ground improvement, fit for reuse. In its current undisturbed state, the ferricrete provides strong evidence of **highly favourable founding conditions**, suitable for shallow pads for light industrial structures, provided that the thickness of the ferricrete is first conclusively established and demonstrated to persist across the full footprint of individual structures.

9.2.5 Zone 5: 2 [Existing HireAll Terrace]

A small enclave comprising the south-western sector of Portion 72 (Erf 956) was the subject of our previous investigation, which led to the terracing of Erf 956, which now accommodates the existing HireAll warehouse. The adjoining Erf 974 was subsequently also terraced - evidently in balanced cut-and-fill - to provide the parking yard for the extensive heavy plant fleet of the HireAll operation. In view of this being an existing functional platform, no further investigation was undertaken on this platform, which is zoned as an existing terrace.

9.2.6 Zone 6: 2 [Quarry]

This zone comprises a quarried clearing of Erf 973 immediately adjacent to the Zone 5 platform on Erf 974. This was possibly constructed with a view to facilitate the lateral expansion of the HireAll plant yard - or for the purpose of harvesting high quality materials for future construction purposes. It is evident that this has been stripped virtually through to the granite rockhead, but observed to cut across the boundary between the granite and the diabase of Zones 2 and 3. It is not apparent whether this has been cut through to the intact rockhead of the diabase zone, which was buried by superficial transported materials at the time of our investigation.

9.2.7 Zone 7: 3 [Surface Spoil]

The zone - which also appears to straddle both the granite and the diabase of Zones 2 and 3 - is characterised by stockpiles of, evidently, good quality, rocky material harvested from the quarry in Zone 6. The presence of the stockpiles precluded confirmation of the in situ residual soils, but is likely to comprise a combination of residual granite and diabase. There is a high probability that the stockpiles could also mask extensive surface rock in this zone, which is assumed to be the case. It is likely that, subject to the removal of the invasive vegetation, these stockpiles may represent valuable fill material, of nominally G5 subbase quality, subject to it being screened an/or crushed to the requisite particle size.

9.2.8 Zone 8: 3 [GDARD Wetland]

Following several iterations of investigation, the GDARD Wetland has now been formally delineated in the low-lying eastern-most sector of the site, buffering an ephemeral drainage line, which precludes any development within this 1.54ha zone. Our investigation did not enter this area in view of development being precluded, but has been observed to comprise highly compressible gullywash soils overlying competent hardpan ferricrete, which forms an impervious horizon rendering this zone susceptible to shallow groundwater accumulation.

9.3 Material Properties

The material assessment provided in Table 3 below is based on a combination of visual-tactile profiling, DCP probing and laboratory results, with the benefit of extensive materials testing in this general area:

Table 3: Materials Assessment

Horizon	TRH14	Earthworks Quality	Recommended Application
Gullywash	G10-sub-G10	Very poor	Typically clayey and saturated, rendering compaction extremely difficult, if not impossible. Unsuitable for reuse in engineering applications. Cut to spoil and do not include in earthworks.
Hillwash	G7	Fair	Harvest and blend with stockpiled materials for engineered fill terraces. Impact roll all areas in the fill zone to remove collapse potential / compressibility.
Pebble Marker	G5-G7	Good to fair	Good quality granular material, but may be significantly oversized in the lower western reaches, necessitating prior **crushing** to render this suitable for subbase applications. Possibly be worthwhile selectively harvesting and stockpiling for **subbase** applications.
Ferruginous Pebble Marker / Ferricrete	G4-G7	Very good to fair	**Subbase** through **mid-specification selected subgrade** applications, suitable for pavement layerworks and earth platforms, provided it is carefully selected and stockpiled from the cuttings. As hardpan ferricrete generally degrades on reworking, this is best left intact in the in situ state in the fill zones, insofar possible, and retained as a foundation base for subsequent pavement layerworks or bulk earthworks.
Reworked Residual Granite	G7-sub-G10	Fair to very poor	Highly variable - likely as a result of several diabase intrusions passing through the site - and frequently found to be low quality and susceptible to swelling. Cautious selection is required as much of this unsuitable for engineering applications, responding poorly to compaction. Ideally cut to spoil, rather than include in the earthworks, as these soils may deteriorate the overall material quality. Where impractical, investigate the use of **lime / cement stabilisation** to reduce the PI and improve compactability, which may improve the material to a net G7. If to be retained, it should be extensively tested using CBR methods to confirm suitability. Impact roll in fill areas to remove collapse potential / compressibility vulnerability.
Residual Granite	G5-sub-G10	Good to very poor	Fair quality granular material with banks of soft rock which will improve overall quality with depth of excavation through to the competent rockhead. Quality of material degrades significantly towards the diabase intrusions necessitating **careful selection** to avoid contamination. Site-specific supplementary CBR testing is considered essential to avoid problematic earthworks.
Weathered Granite Bedrock	G4-G9	Very good to poor	Generally pulverises to a good quality granular material with potential for good compaction. Below the interface with medium hard rock, however, the material will break out with difficulty in large rock fragments, which are likely to be significantly oversized, necessitating screening and crushing prior to layerworks applications. Quality of material, similarly, degrades significantly towards the diabase intrusions, necessitating **careful selection** to avoid contamination.
Reworked Residual Diabase	G9-sub-G10	Very Poor	**Poor quality clayey material, unsuitable for engineering applications**. This material must be carefully identified, as it will contaminate and **substantially degrade the better quality residual granite if carelessly blended**. Cut to spoil wherever encountered, or redeploy in non-loaded earthworks applications which are not settlement sensitive, or where compaction densities are not formally measured.
Residual Diabase	G9-G10	Poor to very poor	No improvement noted with depth for this very poor quality material through to the rockhead. High risk of medium-sized boulder inclusions. Laboratory test results demonstrate that even when harvested from around 3m depth, the fines from this material are very poor, rendering this unsuitable for engineered fill terraces. This material must be carefully identified as it will contaminate and **substantially degrade the better quality residual granite if carelessly blended**. Cut to spoil wherever encountered, or redeploy in non-loaded earthworks applications which are not settlement sensitive, or where compaction densities are not formally measured.
Weathered Diabase Bedrock	Not measured, but possibly G7-G8 at best	Fair	Likely to occur at double the depth of the granite rockhead due to deeper weathering (observed at ~7m below NGL), which is still probable from the deep cutting envisaged. This rock will **likely pulverise** much easier than the granite and produce a **net silt quality soil**, which is **greatly inferior** to the sandy granite. This is likely to **contaminate a crushed granitic material** earmarked for subbase applications, and should be avoided. Ideally separate from the granite rock and used in non-critical earthworks applications where good compaction is not required / compaction densities are not formally measured.

9.4 Excavation Assessment

The excavation assessment of the soil/rock profile - in terms of *SANS 1200D - Earthworks* specification - is presented in Table 2 (Appendix B) and summarised in Table 4 below:

Table 4: Excavation Assessment

Class	Zone 1	Zone 2	Zone 3	Zone 4	Zone 5	Zone 6	Zone 7	Zone 8
Soft	Consistently ranges from surface to 1.1m but locally beyond 2.75m. Includes the hillwash, pebble marker and the reworked and residual granite horizons.	Typically from surface to >2m, with local exceptions. Includes the hillwash, pebble marker and the reworked and residual diabase horizons.	Extremely variable - locally completely absent where the rockhead outcrops. Deep profiles - up to 2m thick - may occur immediately adjacent to visible outcrop.	Generally limited to the upper 0.6m - 1.2m of the profile comprising the hillwash, pebble marker and unbound residual horizons. Possibility that soft excavation may be present beneath the ferricrete.	Already terraced and beyond the scope of this investigation.	Largely stripped off	Loose-lay stockpiles of material possibly harvested from the Zone 6 quarry overlying and masking the natural profile. Potentially soft to 2m below surface.	On evidence of the work on the adjacent sites, the upper 1m-1.5m of the profile typically comprises unbound gullywash soils classified as soft excavation.
Intermediate	Proven in virtually all of the test pits in the form of very dense residual soils through very soft / soft rock. Locally exposed at 1.5m depth but frequently not present in the upper 2m near the hillcrest.	Generally not proven in the deeply weathered intrusive soils of this zone. The intrusion peripheries, however, appear to comprise shallow bedrock from nominally 1.2m-1.5m depth.	Common from below 0.6m in view of the sub-outcrop in this zone.	Accounts for the hardpan ferricrete, of unproven thickness. Hardpan ferricrete at the immediately adjacent airport site is typically 0.6m-0.9m thick.			Should be anticipated to arise sporadically from below 1.5m in view of nearby observations.	From below 1m-1.5m, this zone is typically underlain by competent hardpan ferricrete, masking the underlying residual profile which classifies as intermediate excavation.
Hard	Not proven in the upper 1.5m of the profile and appears unlikely in the upper 2m of the profile.	Not proven in the upper 1.5m of the profile and appears unlikely in the upper 2m of the profile.	Anticipated intermittently in upper 1.5m of the profile.	Not proven in view of the hardpan ferricrete, which could even mask shallow bedrock.		Appears to form the quarry floor which is intermittently exposed in the south-western sector, in particular.	Assuming that the quarry is nominally 2m deep in the granitic zone, hard excavation should be anticipated from around 2m below NGL once the soils are stripped off.	Unlikely to be present in the upper 2m of the profile, on evidence of work on the neighbouring sites.
Boulder (Class A)	Not specifically encountered in this zone and likely to be uncommon in a granitic profile.	Common in the residual diabase, as exposed in the sidewall of the quarry on the periphery of this zone. Occurs sporadically throughout the residual diabase horizon to even substantial depths in view of the deeply weathered profile.	High probability of both types of boulder being present in this zone, frequently protruding above ground surface. As this zone straddles both the granite and the diabase, provision should be made for extensive boulder excavation, which is predominantly Class A (in the diabase zone), but is likely to also include Class B (in the granite zonae).	Not specifically encountered in this zone and likely to be uncommon in a **granitic** profile. Very common in the residual **diabase**. The geological map shows an intrusion passing beneath the ferricrete in this zone which is likely to encounter sporadic boulders if excavations are deep and punch through the ferricrete (which is not advised).		Apparent in the exposed cutting sidewalls around the periphery of the quarry, but no longer expected in the quarry itself, which appears to have been stripped to the rockhead proper.	Common throughout the reworked / residual diabase horizon, visibly exposed in the sidewall of the quarry on the periphery of this zone.	Common in the residual diabase, underlying the ferricrete, where a mapped intrusion is present in this zone. Wetland buffer restrictions will preclude this from being encountered.
Boulder (Class B)	Since granite is prone to the formation of large corestones in the soil:rock transition zone, nominal provision should be allowed for Class B boulder excavation during the bulk earthworks of this zone.	Lower propensity for large boulders to be present within the diabase horizon.		Since granite is prone to the formation of large corestones in the soil:rock transition zone, nominal provision should be allowed for Class B boulder excavation during the bulk earthworks of this zone.		No longer expected in the quarry itself, which appears to have been stripped to the rockhead proper.	Possibly intermittently present where the fill straddles the granitic soils which are prone to the formation of large corestones in the soil:rock transition zone, nominal provision should be allowed for Class B boulder excavation during the bulk earthworks of this zone.	Possibility of large granite boulders to be present below the ferricrete. Wetland buffer restrictions will preclude this from being encountered.

Excavation Classification System:

Soft excavation - Generally possible by hand or conventional light earth-moving equipment (**TLB**)

Intermediate excavation - Necessitates the use of heavier plant (**tracked excavator**) and/or pneumatic ground-engaging-tools for economic excavation

Hard excavation - Requiring **drill-and-blast** operations.

Boulder excavation - All material that, in the opinion of the Engineer, **can be removed** by any means **other than explosives**, including dump-rock and boulders not exceeding 0.5m^3 in volume
Rock occurring in bulk or in bands or ledges, the practicable excavation of which, in the opinion of the Engineer, will **necessitate the use of explosives**, as well as **boulders exceeding 0.5m^3** in volume (whether or not blasting is required for their removal) and which will necessitate the use of heavier plant (tracked excavator) and/or fragmentation prior to transport

9.5 Groundwater

9.5.1 Zone 1

This zone appears to be relatively dry but with latent evidence of shallow groundwater from time to time, which may develop in open excavations but dissipate through the relatively porous material given the slope of the site.

9.5.2 Zone 2

In contrast, prolific shallow groundwater is typically encountered within the vicinity of Zone 2, which may lead to waterlogged / marshy conditions. Shallow groundwater should be allowed for in this zone from near ground level, necessitating dewatering measures and the installation of cut-off drains against cut slopes to render this zone suitable for development.

9.5.3 Zone 3

Following sustained rainfall in this zone, groundwater may be found to perch on the sub-outcrop from time to time, but drain relatively easily through the granitic soils, but be impeded in the diabasic areas.

9.5.4 Zone 4

Similar to Zone 3, groundwater is likely to perch on the hardpan ferricrete of this zone, but drain relatively easily through the granitic soils, given the positive underlying slope. Subsoil drainage would expedite this.

9.5.5 Zone 5

Already terraced, promoting natural runoff of surface water and accommodating the underlying groundwater risks.

9.5.6 Zone 6

The quarry is naturally sloped from north to south, with an underlying ipervious rockhead, which will largely preclude groundwater accumulation.

9.5.7 Zone 7

Natural runoff from the hillcrest will be greatly impeded by the extensive stockpiles of loose fill material, leading to the high probability of artificial groundwater accumulation in this zone.

9.5.8 Zone 8

This Zone, which falls within a natural drainage basin, is likely to exhibit near-surface groundwater accumulation throughout the year, most likely perching on an impervious ferricrete horizon, on evidence of investigative work by ourselves on the neighbouring properties.

9.6 Slope Stability

The average natural slope west of the hillcrest is approximately 1:18 (5.6% or 3.2°), with a more gentle slope east of the hillcrest at approximately 1:22.5 (4.4% or 2.5°).

These moderate natural slopes will necessitate relatively substantial terraces - in the order of 2.5m in cut and 2.5m in fill - to facilitate the construction of small warehouses on single level platforms covering the full footprint of each stand.

In contrast with the general pattern above, the six stands straddling the hillcrest itself have the most favourable of the slopes, necessitating much smaller fill terraces - possibly no more than 1m cut and 1m fill - in a north-south direction.

9.7 Soil Chemistry

The basic soil chemistry for the soils arising in the Lanseria vicinity - determined from a combination of pH, TDS, Conductivity / Resistivity tests - is presented in Table 5 below. These results are consistent with the general pattern for soils within a granitic environment, yielding the following indicative results:

Table 5: Basic Soil Chemistry Assessment

Soil	pH	Resistivity (Ω)	Comment
Gullywash	6.6	5,319	Slightly acidic + mildly corrosive
Hillwash	6.3	4,975	Moderately acidic + corrosive
Pebble Marker	6.5	5,714	Slightly acidic + mildly corrosive
Ferricrete	6.5	5,102	Slightly acidic + mildly corrosive
Reworked Residual Granite	6.3	4,051	Moderately acidic + corrosive / very corrosive
Fill (Residual Granite)	7.5	4,405	Slightly alkaline + corrosive
Transported + Residual Granite	5.7	4,545	Moderately acidic + corrosive
Residual Granite	5.9	4,505	Moderately acidic + corrosive
Residual Granite + Granite Rock	7.2	4,854	Slightly alkaline + corrosive
Reworked Residual Diabase	6.1-6.8	3,984 - 5,917	Moderately acidic + very corrosive

As is apparent, from Table 56, the soils present on this site are generally **mildly to moderately acidic**, except where rock quality material is included. In combination with the **moderate to low resistivity** readings - virtually across the board - all soils on this site should be assumed to be **corrosive** and destructive to any ferrous and/or concrete in ground, necessitating adequate / supplementary cathodic protection and / or sacrificial cover over steel reinforcement to maintain long-term serviceability.

9.8 Foundation Assessment

9.8.1 Granitic Zone

(i) The bulk of the site falls within a residual granite setting, which normally provides favourable material from both a founding and terracing perspective.

(ii) The development of the western half of the site is complicated by the presence of shallow rock, which may take the form of both loose disconnected boulders - which can be relatively easily moved - or shallow bedrock, which places a restriction on cut depths for balanced cut-and-fill terrace operations, but presents a useful shallow founding horizon.

(iii) Hillwash soils are vulnerable to collapse settlement and unsuitable for foundations unless first impact rolled, or conventionally compacted, in which case bearing pressures should be limited to 75kPa.

(iv) The upper pebble marker horizon is judged to be inconsistent and unsuitable for founding and should be stripped and stockpiled and used for earthworks or sub-grade layers for the parking area rather than contemplated as a founding horizon.

(v) Where present on the lower eastern slopes of Zone 4, light industrial structures can take advantage of founding on the competent **hardpan ferricrete**, provided this extends across full footprints - which appears to be the case - using bearing pressures of up to 150kPa. The hardpan ferricrete is best retained intact as a founding / compaction surface, rather than cut for earthworks, which would forfeit the natural cementation and produce a much lower quality material.

(vi) Despite the high apparent strength, the underlying **reworked residual granite** is considered to be ***vulnerable to large (differential) settlements***, to the extent that ***founding on this horizon in an unimproved state should be avoided.*** Foundations on this material should not exceed 75kPa.

(vii) The underlying, **intact residual granite** is shown to be compressible and potentially also collapsible, and only suitable for footings exerting a bearing pressure in the order of 125kPa. As foundation loading in excess of 125kPa will lead to differential movements in excess of that normally acceptable for masonry construction, deeper founding on residual granite of at least dense consistency is required in support of foundations with bearing pressures up to 250kPa.

(viii) The need for site terracing provides the ideal opportunity to improve the bearing capacity of the natural profile. Although generally well suited to compaction, the granites in this area appear to be highly contaminated by the various diabase intrusions, producing very low CBR readings, despite the fair quality foundation indicator parameters. In an unimproved state, these residual granites may be as poor as G10 subgrades, which will be difficult to compact. Stabilisation with lime / cement / chemical additives may be able to reduce the swell potential and improve the compactability to nominally G7 standards, based on the grading modulus, but probably no better than this. Provided equivalent G7 fill terraces can be produced using these interventions, bearing pressures of 150kPa are appropriate.

(ix) Stands straddling the prominent outcrop must appreciate the risks of variable underlying soil conditions, which complicate founding, with the added risk of a possible straddling a geological fault, which should ideally be avoided.

9.8.2 Diabasic Zones

(i) Smaller portions of the site fall within the highly sub-optimal residual diabase zone, which introduces founding challenges, slope stability problems and poor quality construction materials. These materials are generally fine-grained clayey soils with very poor shear strength, low load-bearing capacity, and a high propensity for heave/shrinkage movement.

(ii) Founding in Zone 2 should not be contemplated other than direct on the proved rockhead itself, or utilising piles through these problematic soil horizons.

10. Recommendations

10.1 Foundations

In view of the assessment above, structures in this environment can be founded using one of the following solutions to either *mitigate* or *accommodate* the impact of the prevailing ground conditions. The selection of an appropriate solution requires consideration of the potential for heave/settlement, top-structure stiffness and movement-sensitivity in each instance.

For the purposes of this assessment, **it is assumed the individual stands will first need to be terraced**, necessitating a measure of earthworks on each to produce a level platform for the structure. Following this initial preparatory work, the following founding solutions are considered appropriate for light industrial warehouse structures with an adjoining masonry office structure, as is the norm:

Table 6: Foundation Recommendations

	Foundation Solution	Zone 1	Zone 2	Zone 3	Zone 4	Zone 5	Zone 6	Zone 7
	Normal (Strip footing / slab on the ground)	✗	✗	✗	✗	✗	✗	✗
Structural Solutions	Modified Normal (Reinforced Strip Footing)	⛌	✗	✗	✓	✗	✓	✗
Structural Solutions	Stiffened Strip Footings / Ground Beams or Cellular Raft	✓	✓	✗	✓	✓	✗	⛌
Structural Solutions	Deep Strip / Pad Foundations	✓	⛌	✓	✓	⛌	⛌	✓
Structural Solutions	Pad and Piers / stub columns with Ground-beams	✓	✓	✓	⛌	✗	✗	✓
Structural Solutions	Piles with Ground-beams	⛌	✓	✗	✗	✓	✗	✓
Geotechnical Solutions	Compaction of Soil Below Individual Footings	✗	✗	✗	✗	✗	✓	✗
Geotechnical Solutions	High Quality Engineered Soil Raft / Soi Mattress	✓	✓	✓	✓	✗	✓	✓
Geotechnical Solutions	Impact Rolling (1m-2m compaction)	✓	⛌	✗	⛌	✓	✗	⛌
Geotechnical Solutions	Rapid Impact Compaction (4m deep compaction)	✓	✓	✓	✓	✓	✗	⛌
Geotechnical Solutions	Stone Columns	⛌	✓	⛌	⛌	✓	✗	✗
Geotechnical Solutions	Dynamic Compaction	✗	✗	✗	✗	✗	✗	✗

KEY	
✓	Recommended or well suited foundation solution.
✓	Appropriate but not an optimal solution as it may be more than is necessary in this zone. **OR** There may be some vulnerability to its application on this site. Necessitates further investigation to determine if a viable solution.
⛌	Workable but considered sub-optimal or overly expensive / complicated for this zone. Necessitates further investigation to determine if a viable solution.
✗	Foundation solution is either not appropriate for this geotechnical site class or not recommended given the observed conditions.

10.2 Material Reuse

(i) The hillwash horizon on this site is generally of ~G7 selected subgrade quality, suitable for reuse.

(ii) The **colluvial pebble marker**, particularly in combination with **ferricrete**, classify as high grade subbase (G5/G6) materials, suitable for selective harvesting. Where talus particle size is excessive, however, prior crushing to the requisite grade will be required.

(iii) Where present in hardpan layers in the *fill side* of the site, the **ferricrete** is already in an optimal state of density, and is best left undisturbed in situ and rather used as the pioneer layer for subsequent layerworks, as this degrades on handling. Indications are, however, that it meets G5 standards.

(iv) Laboratory test results show that the **reworked and residual diabase** soils, which weather to fine-grained and potentially expansive silts and clays, are *very poor quality* materials, unsuitable for reuse in engineered fills, except in insensitive bulk fill applications, where no structures are proposed.

(v) The same limitations apply to all **residual granitic soils in close proximity to Zone 2**, which are of a very poor quality, and will tend to contaminate the overall quality of engineered fill, to the extent that these should, rather, be separated and disposed of, where found to contain a high fines content.

(vi) Where present in the fill zone, any medium dense / better granitic soils are best left undisturbed to take advantage of both their natural in situ density and any positive cementation offered by the ferricrete. In the cut zone, however, the materials show mixed reuse opportunity, necessitating further site-specific laboratory testing to confirm suitability / otherwise.

(vii) Despite the reasonable grading modulus of the **altered residual granite** soils - which would normally satisfy G7 standards - moisture-density compaction tests show a *very poor response to compaction,* returning sub-G10 quality results, rendering these materials **unsuitable** for high quality fill terrace construction, unless these can be adequately improved through lime stabilisation.

(viii) Where sufficiently far from the diabase so as to be unimpacted, these **residual granitic soils** are found to improve in quality, generally meeting at least G7 standards, rendering these suitable for reuse in selected layerworks and fills of modest loading requirements. Delineation of the transition points will only be possible once large excavations are opened for inspection.

(ix) **Residual granite** from Zone 1, sufficiently far from the diabase intrusions, shows potential to meet *subbase standards* (G5-G6), but deteriorate rapidly towards the diabase of Zone 2.

(x) Notwithstanding the above, a substantial volume of residual granite which may be recovered from any deep cutting is likely to provide good to fair quality fill, in the order of a G6-G7 selected subgrade, suitable for reuse in the proposed fill terraces.

(xi) The quality of the granite is likely to improve with depth, particularly where this is of soft rock quality, potentially producing a net G4-G5 material, well suited to MSE wall construction, but may necessitate some screening and/or crushing as a perquisite to use.

(xii) Unlike the granitic rock, which breaks down to a net sandy soil, the diabasic rock pulverises to a very low grade silty soil, provisionally rendering this unsuitable for reuse, unless demonstrated otherwise.

10.3 Surface Beds and Hard Stands

All surface beds should be constructed on a consistent bed of imported G5/G6 material, typically no less than 300mm thick, compacted to 95% Mod AASHTO density to prevent cracking induced by differential support. As this class of material is generally absent on this site, other than from deep box cuts, these materials may need to be imported from commercial quarries, unless it can be demonstrated - through further laboratory testing - that the loose stockpiles in Zone 7 can be screened and crushed to the requisite grade, so as to satisfy the requirements of a subbase material.

10.4 Slope Stability

In view of the terracing requirements for the development of this moderately sloped site, slope stability checks are required for both cut and fill sides of the terrace to model the impact of any terracing on the retaining walls themselves. Potential impacts of the slopes on adjacent properties affected by these terraces, must take cognizance of the strong possibility of an elevated fill terrace directly above a similarly deep cutting.

In the absence of specific shear strength testing, cut slopes should typically be battered at 1V:2.5H and 1V:3H in fill - to facilitate rehabilitation through vegetation, failing which ravelling and scour can be expected to occur unabated.

Where these generally favourable slopes cannot be constructed in view of the loss of real estate, formal soil retaining walls / lateral support will be necessary to support the slopes, for which more detailed investigation is required on each stand.

Where the high fill terrace straddles adjacent geotechnical zones - noting that the boundaries are imprecise - the soil properties of the more vulnerable material - typically the residual diabase - should be used in the design of the structures, with due cognizance given to the variable founding conditions between the zones.

Any temporary deep excavations - as may be required for either water-borne services, deep foundations or a box cut in preparation for terrace / soil mattress construction - should be formed no steeper than 1V:1H to protect any workers in the trenches, as the sidewalls will be susceptible to slumping under the action of vibratory compaction equipment in the trenches, failing which all sidewalls should be supported with appropriate shoring.

The surcharging of deep services trenches, cut sidewalls and foundation excavations by way of spoil heaps, construction materials and equipment (including those with outrigger jacks) should be strictly avoided as being highly detrimental to cut stability, particularly when workers are present in the excavation.

10.5 Drainage Precautions

(i) Where fill terraces stand proud of natural ground level and formed on an improved foundation of well-compacted residual soil, no additional subsoil drainage precautions are deemed necessary.

(ii) Subsoil drains should, however, be installed parallel to all cut slopes to intercept natural groundwater migration.

(iii) Provision should be made for subsoil drainage at the interface between the granite and impervious diabase, where subsurface groundwater collection is likely.

(iv) The hardpan ferricrete in Zone 4 is indicative of periodic shallow groundwater, to the extent that subsoil drainage should be used throughout this zone, particularly if foundations are placed in a low quality fill terrace, rather than directly on the underlying ferricrete.

(v) Surface water attenuation is likely to be required to reduce the flow rate off this future industrial park, which is ideally discharged, in a controlled fashion, into the wetland of Zone 8. This will obviate the need for impervious liners, as seepage from the attention pond into the wetland is considered non-problematic.

(vi) Care should, however, be exercised in ensuring that the discharge is directed away from the elevated fill of Lanseria Airport's Taxiway Charlie, which may, otherwise, be compromised by uncontrolled / concentrated stormwater emanating from this development.

11. General Recommendations

(a) Unless fully rehabilitated in the bulk earthworks operations, the exploratory hole positions could potentially impact on the integrity of future foundations / hard stand areas. Where this is the case, loosely backfilled holes need to be formally rehabilitated so that the proposed structure(s) are not compromised.

(b) Given the complexity of this site, with structures potentially able to straddle even multiple zones, it is recommended that the Geotechnical Specialist be appointed to interact with the professional team to provide ongoing support for the duration of this project to further investigate, delineate transition zones, provide costings, undertake preliminary designs and procurement advice, finalise the designs, and inspect / monitor the ground improvement / foundation works for compliance with the project recommendations and specifications on all in-ground works.

Periodic inspection of the works during construction will provide for confirmation of the recommendations given in this report, and for any significant changes from the anticipated conditions to be taken into account timeously, so as to avoid unnecessary expense due to construction errors.

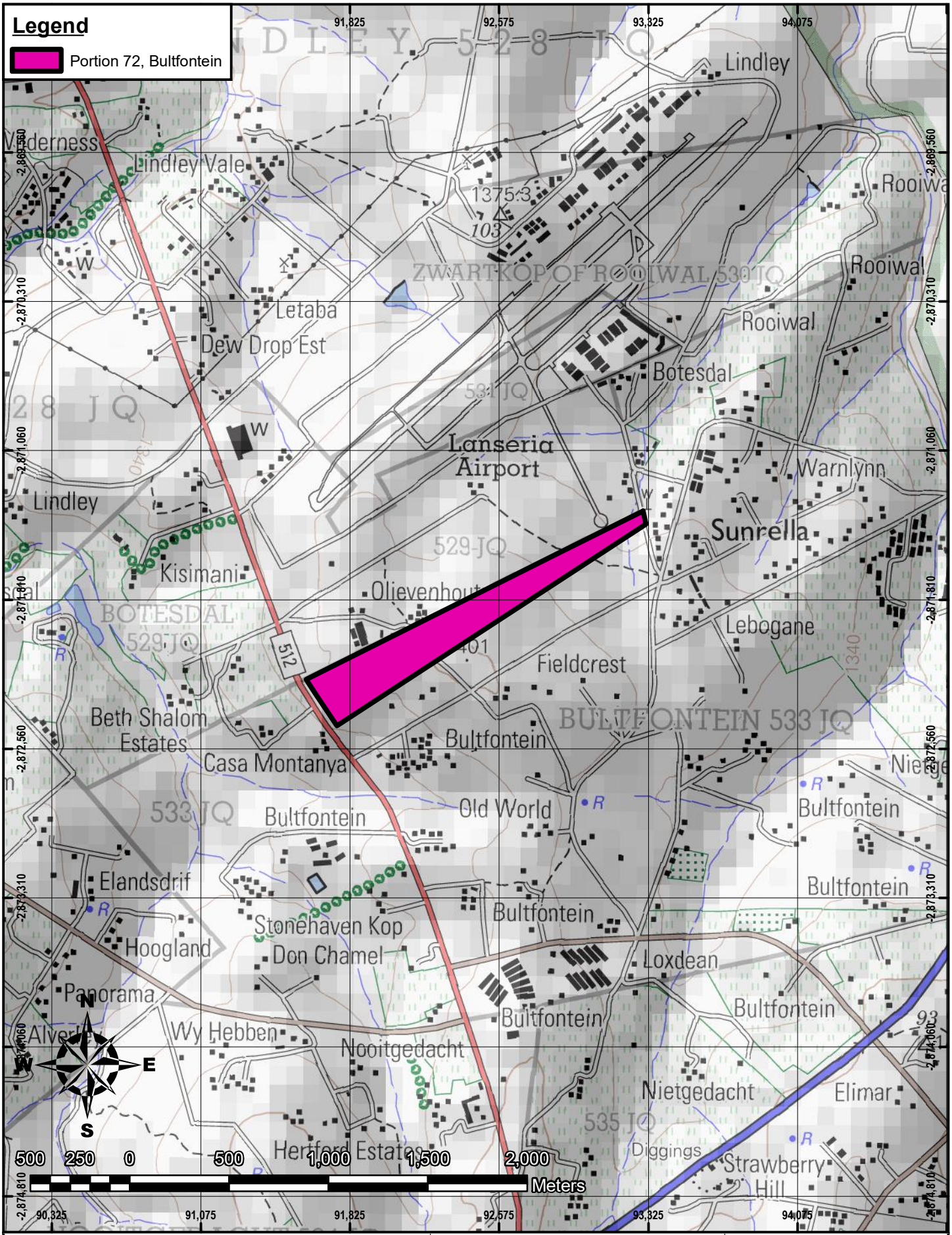
(c) Additional design-level investigative work necessary to optimize foundation works / ground improvement / deep cuts with lateral support and high fills with retaining walls are expected to include:

- Detailed rotary core drilling on the proposed alignment of high cut slopes to establish the geotechnical parameters necessary for the lateral support.
- Supplementary investigation, by means of test pits, DCP and DPSH probing along the proposed alignment of all future fill retaining walls, to establish the design-level geotechnical parameters affecting global stability, settlement, bearing pressure and overall shear strength.
- Undertaking the slope stability analyses for both the cut and fill slopes, lateral support, CBRWs or MSEWs.
- Modelling of the bulk earthworks to optimise the platform design.
- Professional input, by the Geotechnical Specialist, for the design of lateral support, shoring and battering of the proposed cut, including the design of subsoil drainage.
- Professional design input, by the Geotechnical Specialist, for the earth fill terraces / earth mattresses / soil raft / ground improvements and deep foundation solutions, including performance criteria and detailed design considerations.
- Rigorous testing of the materials emanating from the bulk cut to verify the quality of the materials as well as the compaction parameters for reuse in the fills, particularly where there is a risk of condemning large volumes of material which might otherwise be reusable.
- Inspection of bulk fill earthworks, excavations and foundation trenches to verify the allowable bearing pressures and compliance with the Code of Practice and the engineer's design requirements.

CS MORGAN Pr Eng | Director
Geoid Geotechnical Engineers

APPENDIX A

Figures



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TITLE:
Portion 72, Bultfontein
Regional Topographic Setting

CLIENT:
Craig Murchie | HireAll

PROJECT NUMBER:	GGE/24009
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DATE:	17/05/2024
ENGINEER:	CS Morgan
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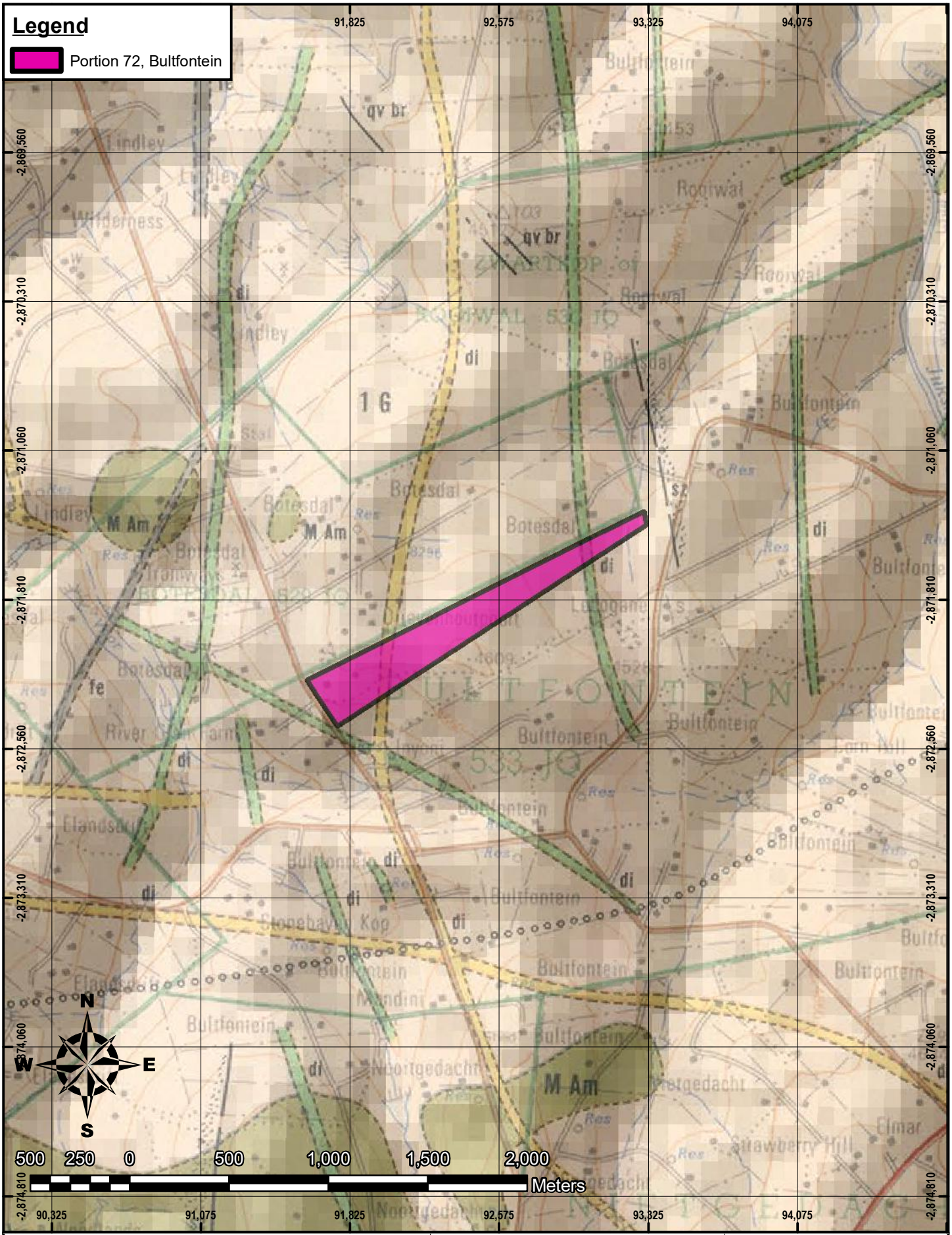

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TITLE:

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PROJECT NUMBER:	**GGE/24009**
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ENGINEER:	**CS Morgan**
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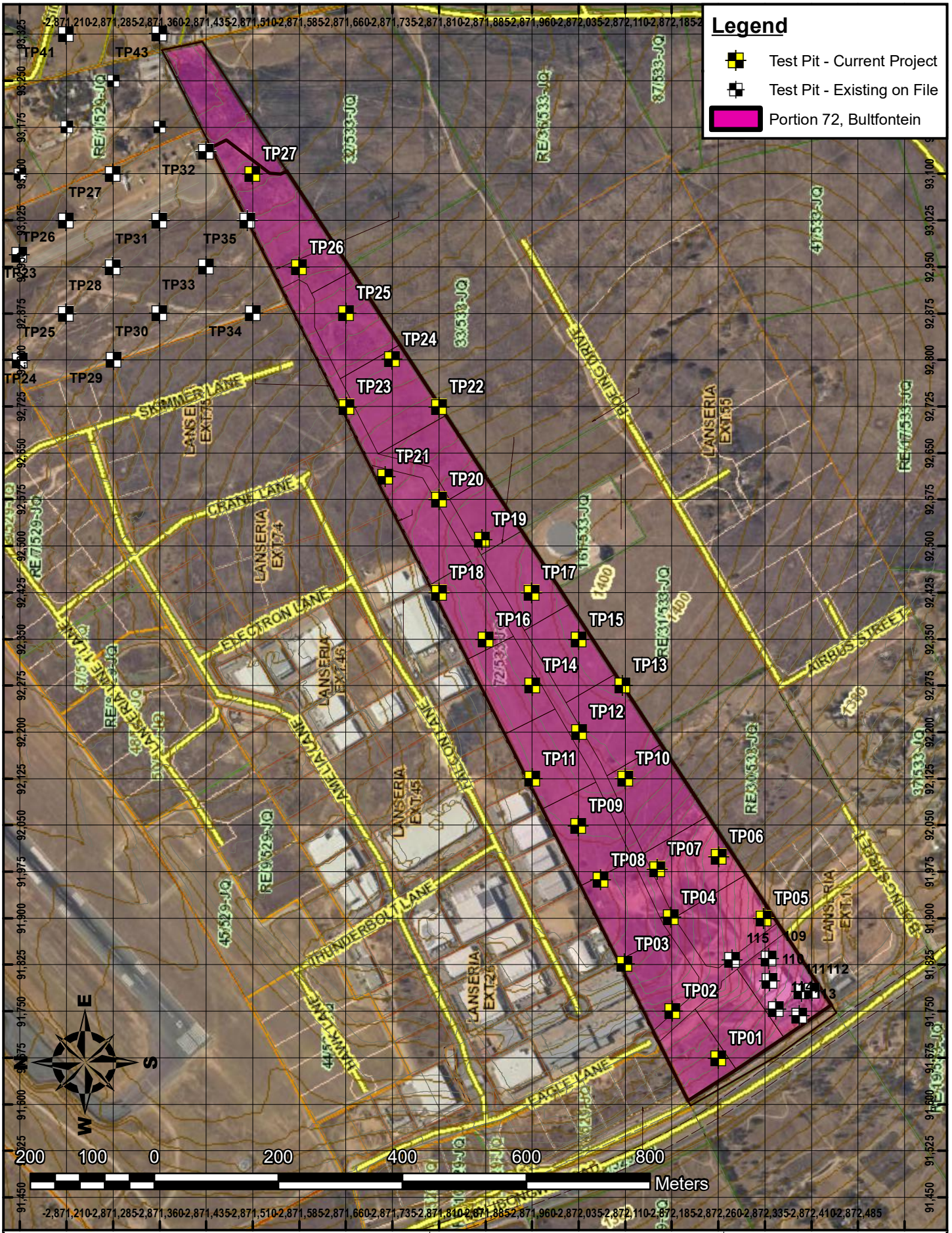

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TITLE:

Portion 72, Bultfontein
Approximate Fieldwork Positions

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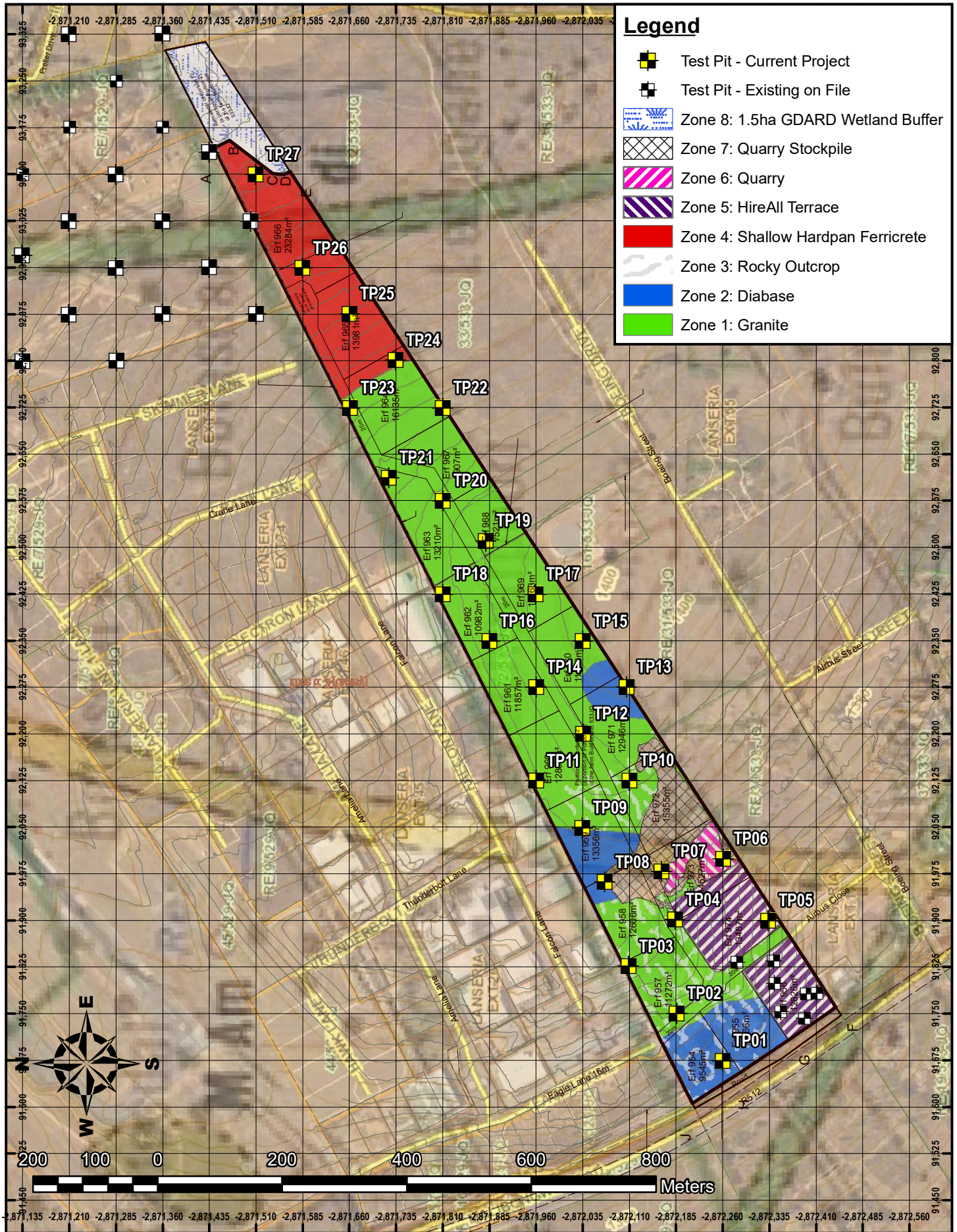
PROJECT NUMBER:	GGE/24009
DRAWING NUMBER:	Figure 3
REVISION:	0
DATE:	17/05/2024
ENGINEER:	CS Morgan
SCALE:	1:8,000
DATUM:	WG27



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TITLE:

Portion 72, Bultfontein
Inferred Geotechnical Zonation

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DATE:	**24/05/2024**
ENGINEER:	**CS Morgan**
SCALE:	**1:8,000**
DATUM:	**WG27**

APPENDIX B

Tables

Table 1: Summary of Soil Index and Material Properties

Hole No	Material	Depth (m)	Atterberg Limits									Mod AASHTO Compaction		CBR			Swell at 100% MA	PRA	UCS	TRH14 *
			LL	PI (425)	LS	GM	NMC	PI (w)	425	075	002	MDD	OMC	90	93	95				
TP01	Residual Diabase	1.0-1.2	43	18	9	0.42	12	16	91	69	16	-	-	-	-	-	-	A.7.6	CL	G9*
TP08	Reworked Residual Diabase	0.45-2.0	43	15	8	0.46	25	13	89	69	14	2,083	7	1	2	3	0.71	A.7.6	ML	Sub-G10
TP13	Reworked Residual Diabase	1.1-1.5	37	18	9	0.41	16	16	90	72	16	1,982	10	1	1	2	0.99	A.6	CL	Sub-G10
TP13	Reworked Residual Diabase	1.1-1.5	34	10	5	0.78	8	8	74	61	8	-	-	-	-	-	-	A.6	ML/CL	G7*
TP19	Reworked Residual Granite	0.4-1.5	NP	NP	0	1.12	13	NP	63	37	1	2,151	8	1	1	2	0.43	A.4	SM	Sub-G10
TP19	Residual Granite	1.5-2.3	35	11	5	0.99	15	7	63	48	6	2,000	12	2	3	4	0.75	A.6	SC	Sub-G10
TP20	Pebble Marker	0.1-0.3	NP	NP	0	2.16	3	NP	28	18	1	2,193	6	16	26	35	0.0	A.1.b	SM	G6
TP109	Pebble Marker	0.05-0.25	NP	NP	0	1.90	2	NP	37	21	4	2,105	7	17	28	39	0.31	A.1.b	SM	G6
TP109	Reworked/Residual Granite	0.25-2.05	NP	NP	0	1.65	5	NP	37	20	4	2,093	8	26	39	52	0.06	A.1.b	SM	G5
Hole No	**Material**	**Depth (m)**	**LL**	**PI (425)**	**LS**	**GM**	**NMC**	**PI (w)**	**425**	**075**	**002**	**DD**	**e_0**	**ε_{65}**	**ε_{127}**	**ε_{251}**	**% MA**	**PRA**	**USC**	**Pc**
TP08	Reworked Residual Diabase	0.9-1.1	44	18	9	0.35	35	17	95	70	15	1,139	1.34	0.35	1.25	3.40	55%	-	-	150
TP08	Reworked Residual Diabase	2.1-2.3	-	-	-	-	-	-	-	-	-	1,141	1.22	1.25	2.30	3.60	55%	A.7.6	CL	400
TP19	Reworked Residual Granite	0.8-1.0	NP	NP	0	1.12	13	NP	63	37	1	1,539	0.73	0.65	1.40	2.60	72%	A.4	SM	250
TP19	Residual Granite	1.6-1.8	35	11	5	0.99	15	7	63	48	6	1,408	0.89	0.40	1.10	2.15	70%	A.6	SC	250
TP22	Residual Granite	1..2-1.4	-	-	-	-	-	-	-	-	-	1,141	1.25	1.50	2.80	4.60	57%	A.6	SC	275
TP111	Reworked Residual Granite	0.5-0.7	38	15	8	0.88	10	11	71	44	13	1,177	1.17	0.55	1.35	2.30	56%	A.6	SC	250
TP111	Residual Granite	1.4-1.6	39	9	5	0.91	14	6	67	42	7	1,523	0.68	2.00	6.30	11.35	73%	A.4	SC	75
TP114	Residual Diabase	0.5-1.0	41	11	5	0.50	23	10	90	56	12	-	-	-	-	-	-	A.7.5	ML	-

KEY

LL: Liquid limit
PI (425): Plasticity index of sample fines portion
LS: Linear shrinkage
pH: Acidity / Alkalinity index
e_0: Initial Void Ratio
GM: Grading modulus
NMC: Natural moisture content
PI (w): Plasticity index of whole sample
TRH14: Road Construction Material Classification

425: Percent passing 425 μm sieve
075: Percent passing 75 μm sieve
002: Percent passing 2 μm sieve
resist: Electrical Resistivity (Ω/cm)
DD: Dry density (kg/m^3)
MDD: Maximum dry density at Mod AASHTO compaction (kg/m^3)
OMC: Optimum moisture content at Mod AASHTO compaction (%)
CBR: California Bearing Ratio
% MA: In situ density as a % of Mod AASHTO compaction

PRA: AASHSTO soil classification
USC: Unified Soil Classification
Pc: Pre-consolidation pressure (kPa)
*: Estimated classification subject to CBR verification
ε: Material strain (%) at given load in kPa

Table 2: Depth and Inferred Thickness of the Soils / Rocks Underlying the Site and Excavation Classification According to *SANS 1200D: Earthworks*

Hole No.	Hole Depth (m)	Depth to the Base of Horizon (m)						Depth to Top of Rock (m)	Depth (m) to Base of		Hard Rock Excavation From (m)	Boulder Excavation Class A (<0.8m)	Depth to Ground Water (m)
		Hillwash	Pebble Marker	Reworked Residual Granite	Residual Granite	Reworked Residual Diabase	Residual Diabase		Soft Excavation	Intermediate Excavation			
CURRENT INVESTIGATION													
TP01	1.20	-	0.40	-	-	1.20	-	1.20	1.20	1.20+	NP	YES	NE
TP02	2.25	-	0.35	1.30	2.25+	-	-	NP	2.00	2.25+	NP	NE	NE
TP03	0.75	-	-	-	0.75	-	-	0.75	-	0.75+	NP	NE	NE
TP04	1.55	-	0.45	1.55	-	-	-	1.55	1.55	1.55+	NP	NE	NE
TP05	EXCLUDED - IN HIRE ALL PLANT YARD												
TP06	0.60	-	0.30	0.60	-	-	-	0.60	0.60	NP	0.6	NE	NE
TP07	1.80	0.50	1.20	1.80+	-	-	-	NP	1.80	1.80?	NP	YES	NE
TP08	3.00	-	0.45 [1]	-	-	2.80	3.0+	NP	3.00+	NP	NP	YES	NE
TP09	2.30	0.25	0.90	1.70 [2]	2.30+	-	-	NP	2.30+	NP	NP	NE	NE
TP10	2.85	-	0.70	2.15	2.85+	-	-	NP	2.85+	NP	NP	NE	NE
TP11	2.75	0.30	0.60	2.00	2.75+	-	-	NP	2.75+	NP	NP	NE	NE
TP12	2.05	-	0.50	1.60 [2]	2.05+	-	-	NP	2.05+	NP	NP	NE	NE
TP13	1.50	-	0.20	1.10	-	1.50	-	1.50	1.50	1.50+	NP	NE	NE
TP14	1.75	0.25	0.50	1.60 [1]	1.75	-	-	NP	1.75	1.75+	NP	NE	NE
TP15	1.70	0.10	0.25	1.45	1.70	-	-	1.70	1.50	1.70+	NP	NE	NE
TP16	1.60	0.25	0.60 [1]	1.50 [1]	1.60	-	-	1.60	1.60	1.60+	NP	NE	NE
TP17	1.45	0.20	0.40	1.25	1.45	-	-	NP	1.45	1.45+	NP	NE	NE
TP18	1.10	0.20	0.40 [1]	0.90	1.10	-	-	1.10	1.10	1.10+	NP	MINOR	NE
TP19	2.30	0.20	0.40	1.50	2.30+	-	-	NP	2.30+	NP	NP	NE	NE
TP20	2.00	0.10	0.30	1.50	2.00	-	-	2.00	2.00	2.00+	NP	NE	NE
TP21	1.50	0.20	0.40	1.20	1.50	-	-	1.50	1.50	1.50+	NP	NE	NE
TP22	2.20	0.20	0.75 [1]	1.20	2.20+	-	-	NP	2.20+	NP	NP	NE	NE
TP23	2.50	0.30	0.35	1.60	2.50+	-	-	NP	2.50+	NP	NP	NE	NE
TP24	1.20	0.10	0.40 [1]	1.20 [1]	-	-	-	1.20 [3]	1.20	1.20+	NP	NE	NE

Hole No.	Hole Depth (m)	Depth to the Base of Horizon (m)						Depth to Top of Rock (m)	Depth (m) to Base of		Hard Rock Excavation From (m)	Boulder Excavation Class A (<0.8m)	Depth to Ground Water (m)
		Hillwash	Pebble Marker	Reworked Residual Granite	Residual Granite	Reworked Residual Diabase	Residual Diabase		Soft Excavation	Intermediate Excavation			
TP25	1.35	0.20	0.70 [1]	1.35 [1]	-	-	-	1.35 [3]	1.35	1.35+	NP	NE	NE
TP26	1.35	0.20	0.75 [1]	1.35 [1]	-	-	-	1.35 [3]	1.20	1.35+	NP	NE	NE
TP27	0.70	0.40	0.70 [3]	-	-	-	-	0.70 [3]	0.60	0.70+	NP	NE	NE
FORMER INVESTIGATION													
TP109	2.05	-	0.25	1.00	2.05	-	-	2.05	2.05	2.05+	NP	NE	NE
TP110	1.05	-	-	-	1.05	-	-	0.00	0.00	1.05+	NP	NE	NE
TP111	2.00	-	0.35	1.20	2.00	-	-	NE	2.00	2.00+	NP	NE	NE
TP112	0.85	-	0.15	-	0.85	-	-	0.15	0.15	0.85+	NP	NE	NE
TP113	0.95	-	0.25	0.85	0.95	-	-	0.95	0.95	0.95+	NP	NE	0.90
TP114	1.90	0.50	-	-	-	1.80	1.90	1.90	1.90	1.90+	NP	NE	0.55
TP115	2.15	-	0.10	1.15	2.15	-	-	2.15	2.15	2.15+	NP	NE	NE

KEY:

NP: Not proven
NE: Not encountered
1: Ferruginous
2: Altered by a nearby diabase intrusion
3: Hardpan ferricrete

Excavation Classification System:

Soft excavation - generally possible by hand or using conventional light earth-moving equipment (**TLB** and the like).
Intermediate excavation - necessitates the use of heavier plant (**tracked excavator**) and/or pneumatic ground-engaging-tools for economic excavation.
Hard excavation - requires **drill-and-blast** operations.
Boulder excavation - which may require **large plant** and/or **pneumatic fragmentation** of large particulate material for the practicable transportation thereof.

APPENDIX C

Soil Profiles

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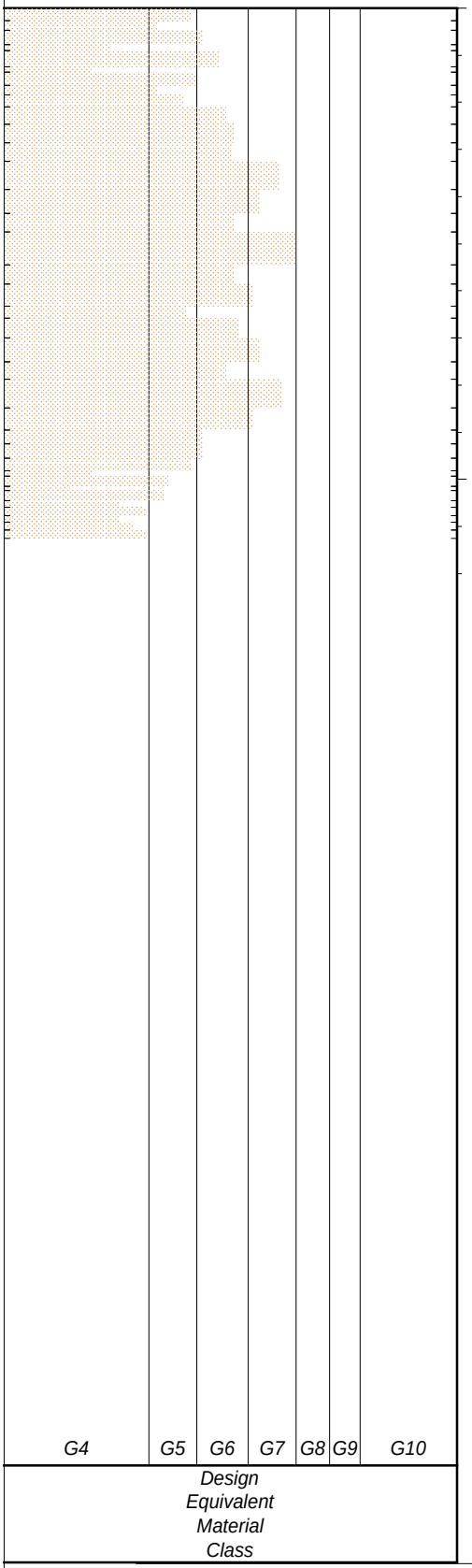
LANSERIA EXTENSION 81
Ptn of Ptn 2 of the Farm Bultfontein 533-IQ
Corpclo 1482 (Pty) Ltd

HOLE No: **TP01**
Sheet 1 of 1

JOB NUMBER: GGE/24009



0.00	Slightly moist, greyish-brown blotched pale orange and dull orange, loose, porous, silty sand with abundant rounded gravel.	
	PEBBLE MARKER	
0.40	Slightly moist, reddish-orange mottled pale yellow blotched greyish-brown, firm, slightly shattered, clayey sand.	
	REWORKED RESIDUAL DIABASE	
1.00	Slightly moist, dark grey blotched olive-brown, firm to stiff, shattered, sandy clay.	
	RESIDUAL DIABASE	
1.20	End of hole at abrupt refusal on boulder in RESIDUAL DIABASE.	

NOTES

1) Stable test pit sidewalls.
2) No groundwater proven in depth of excavation.
3) Bulk sample B01/1 taken from 1.0m--1.2m.

CONTRACTOR : HireAll
MACHINE : JCB.3CX
DRILLED BY : Mosa
PROFILED BY : CS Morgan

TYPE SET BY : KG
SETUP FILE : DPL.SET

INCLINATION : Vertical
DIAM : 0.75m
DATE : 6 May 2024
DATE : 6 May 2024

DATE : 05/06/2024 11:16
TEXT : ..\GGE24009Bultfontein.txt

ELEVATION :
X-COORD :
Y-COORD :

HOLE No: **TP01**

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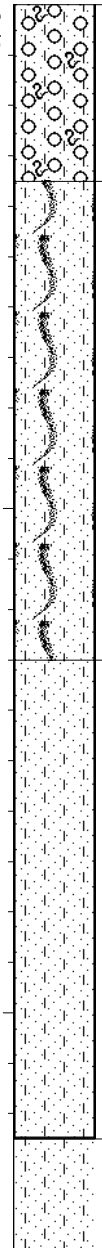
LANSERIA EXTENSION 81
Ptn of Ptn 2 of the Farm Bultfontein 533-IQ
Corpclo 1482 (Pty) Ltd

HOLE No: **TP02**
Sheet 1 of 1

JOB NUMBER: GGE/24009

Scale 1:15



0.00	Abundant sub-angular and sub-rounded quartz gravel in a matrix of slightly moist, greyish-brown, loose to medium dense, porous, silty sand; fine roots. PEBBLE MARKER
0.35	Slightly moist to moist, reddish-orange blotched dark brown, medium dense, partially intact and relict-structured, silty sand with loose runnels. REWORKED RESIDUAL GRANITE
1.30	Slightly moist, reddish-orange speckled dark green silver and pale yellow, dense to very dense, intact and relict-structured, silty sand. RESIDUAL GRANITE?
2.25	End of hole at nominal refusal on very dense, RESIDUAL GRANITE.

NOTES

1) Stable test pit sidewalls.
2) No groundwater proven in depth of excavation.
3) No samples taken.

G4	G5	G6	G7	G8	G9	G10
Design Equivalent Material Class						

CONTRACTOR : HireAll
MACHINE : JCB.3CX
DRILLED BY : Mosa
PROFILED BY : CS Morgan

TYPE SET BY : KG
SETUP FILE : DPL.SET

INCLINATION : Vertical
DIAM : 0.75m
DATE : 6 May 2024
DATE : 6 May 2024

DATE : 05/06/2024 11:16
TEXT : ..\GGE24009Bultfontein.txt

ELEVATION :
X-COORD :
Y-COORD :

HOLE No: **TP02**

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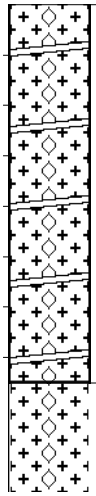
LANSERIA EXTENSION 81
Ptn of Ptn 2 of the Farm Bultfontein 533-IQ
Corpclo 1482 (Pty) Ltd

HOLE No: TP03
Sheet 1 of 1

JOB NUMBER: GGE/24009

Scale 1:15



0.00 Off-white mottled pale orange and pale yellow, highly weathered soft rock granite with sparse in-fill of greyish-brown, silty sand.

GRANITE

0.75 End of hole at refusal on soft rock granite.

GRANITE

NOTES

1) Stable test pit sidewalls.
2) No groundwater proven in depth of excavation.
3) Surface extensively littered with cobbles and boulders.
4) No samples taken.

G4	G5	G6	G7	G8	G9	G10
Design Equivalent Material Class						

CONTRACTOR : HireAll
MACHINE : JCB.3CX
DRILLED BY : Mosa
PROFILED BY : CS Morgan

INCLINATION : Vertical
DIAM : 0.75m
DATE : 6 May 2024
DATE : 6 May 2024

ELEVATION :
X-COORD :
Y-COORD :

TYPE SET BY : KG
SETUP FILE : DPL.SET

DATE : 05/06/2024 11:16
TEXT : ..\GGE24009Bultfontein.txt

HOLE No: TP03

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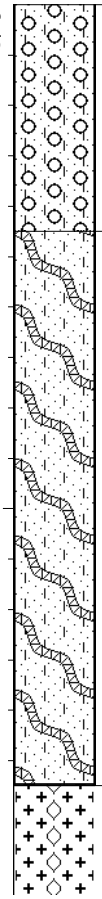
LANSERIA EXTENSION 81
Ptn of Ptn 2 of the Farm Bultfontein 533-IQ
Corpclo 1482 (Pty) Ltd

HOLE No: **TP04**
Sheet 1 of 1

JOB NUMBER: GGE/24009

Scale 1:15



0.00	Slightly moist to moist, medium brown blotched off-white and pale orange, loose, porous, silty sand, with abundant sub-angular quartz gravel. PEBBLE MARKER
0.45	Slightly moist to moist, reddish-orange speckled pale yellow blotched brown, medium dense, partially intact and relict-structured, silty sand, with prominent pegmatite veins. REWORKED RESIDUAL GRANITE
1.55	End of hole at abrupt refusal on highly weathered soft rock. GRANITE

NOTES

1) Stable test pit sidewalls.
2) No groundwater proven in depth of excavation.
3) No samples taken.
4) Yard fence encroaches on this property.

1

G4	*G5*	*G6*	*G7*	*G8*	*G9*	*G10*
Design Equivalent Material Class						

CONTRACTOR : HireAll
MACHINE : JCB.3CX
DRILLED BY : Mosa
PROFILED BY : CS Morgan

TYPE SET BY : KG
SETUP FILE : DPL.SET

INCLINATION : Vertical
DIAM : 0.75m
DATE : 6 May 2024
DATE : 6 May 2024

DATE : 05/06/2024 11:16
TEXT : ..\GGE24009Bultfontein.txt

ELEVATION :
X-COORD :
Y-COORD :

HOLE No: **TP04**

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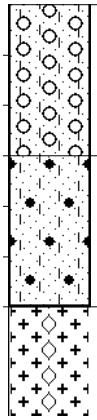
LANSERIA EXTENSION 81
Ptn of Ptn 2 of the Farm Bultfontein 533-IQ
Corpclo 1482 (Pty) Ltd

HOLE No: **TP06**
Sheet 1 of 1

JOB NUMBER: GGE/24009

Scale 1:15



0.00

Abundant sub-rounded quartz gravel in a matrix of slightly moist, greyish-brown, loose, porous, silty sand.

PEBBLE MARKER

0.30

Pale orange blotched black and pale grey, dense to very dense, silty sand, with abundant partially decomposed rock and trace ferricrete.

REWORKED RESIDUAL GRANITE

0.60

End of at refusal on light grey blotched pink and pale yellow, highly weathered, jointed, medium hard rock, GRANITE.

NOTES

1) Profile of the quarry south-western sidewall.
2) Stable test pit sidewalls.
3) No groundwater proven in depth of excavation.
4) No samples taken.

G4	*G5*	*G6*	*G7*	*G8*	*G9*	*G10*
Design Equivalent Material Class						

CONTRACTOR : HireAll
MACHINE : JCB.3CX
DRILLED BY : Mosa
PROFILED BY : CS Morgan

TYPE SET BY : KG
SETUP FILE : DPL.SET

INCLINATION : Vertical
DIAM : 0.75m
DATE : 6 May 2024
DATE : 6 May 2024

DATE : 05/06/2024 11:16
TEXT : ..\GGE24009Bultfontein.txt

ELEVATION :
X-COORD :
Y-COORD :

HOLE No: **TP06**

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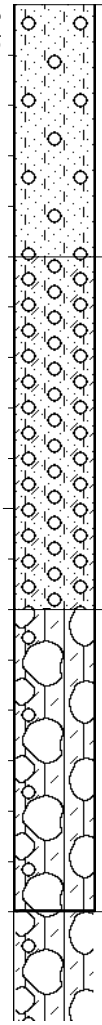
LANSERIA EXTENSION 81
Ptn of Ptn 2 of the Farm Bultfontein 533-IQ
Corpclo 1482 (Pty) Ltd

HOLE No: **TP07**
Sheet 1 of 1

JOB NUMBER: GGE/24009

Scale 1:15



0.00	Slightly moist, greyish-brown, loose, porous, silty sand, scattered gravel. HILLWASH
0.50	Abundant sub-rounded quartz gravels in a matrix of slightly moist, brown, loose, porous, clayey silty sand. PEBBLE MARKER
1.20	Scattered diabase spheroids in a matrix of slightly moist, dusky-red blotched black, firm, shattered, gravelly clayey silt. REWORKED RESIDUAL DIABASE
1.80	End of hole not at refusal - continues as above.

NOTES

1) Profile of the quarry northern sidewall.
2) Stable test pit sidewalls.
3) No groundwater proven in depth of excavation.
4) No samples taken.

1

G4	*G5*	*G6*	*G7*	*G8*	*G9*	*G10*
Design Equivalent Material Class						

CONTRACTOR : HireAll
MACHINE : JCB.3CX
DRILLED BY : Mosa
PROFILED BY : CS Morgan

TYPE SET BY : KG
SETUP FILE : DPL.SET

INCLINATION : Vertical
DIAM : 0.75m
DATE : 6 May 2024
DATE : 6 May 2024

DATE : 05/06/2024 11:16
TEXT : ..\GGE24009Bultfontein.txt

ELEVATION :
X-COORD :
Y-COORD :

HOLE No: **TP07**

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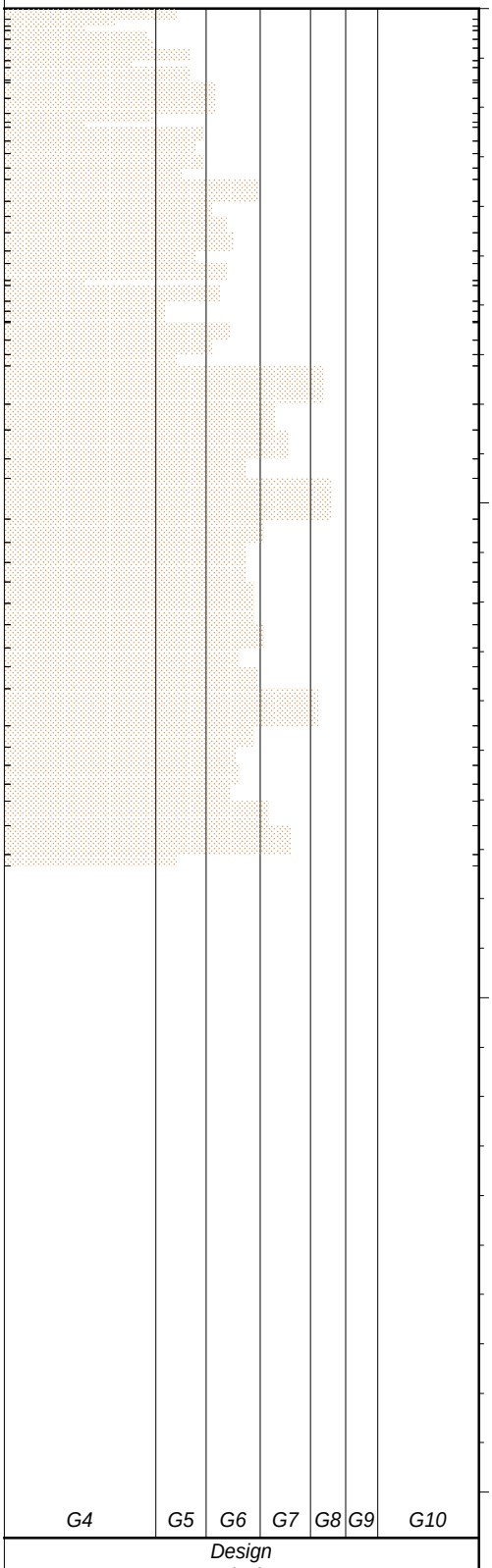
LANSERIA EXTENSION 81
Ptn of Ptn 2 of the Farm Bultfontein 533-IQ
Corpclo 1482 (Pty) Ltd

HOLE No: TP08
Sheet 1 of 1

JOB NUMBER: GGE/24009



0.00 Abundant sub-rounded quartz gravel clast-supported in a matrix of slightly moist, brown blotched red and black, loose, porous, silty sand.

FERRUGINOUS PEBBLE MARKER

0.45 Moist, dusky-red blotched brown, soft to firm, partially intact and relict-structured, sandy clayey silt, with clay seams.

REWORKED RESIDUAL DIABASE

2.00 Slightly moist to moist becoming wet, orange-brown mottled pale yellow, firm, largely intact and relict-structured, clayey silt with scattered spheroids at depth.

REWORKED RESIDUAL DIABASE

2.80 Moist to very moist, greyish-brown spotted black mottled pinkish-red, soft to firm, largely intact and relict-structured, slightly ferruginous, clayey silt with scattered spheroids.

RESIDUAL DIABASE

3.00 End of hole not at refusal - continues as above.

NOTES

1) Stable test pit sidewalls.
2) No groundwater proven in depth of excavation.
3) Undisturbed sample U08/1 taken from 0.9m--1.1m.
4) Undisturbed sample U08/2 taken from 2.1m--2.3m.
5) Disturbed sample D08/2 taken from 2.8m--3.0m.
6) Bulk sample B08/1 taken from 0.45m--2.0m.

CONTRACTOR : HireAll
MACHINE : JCB.3CX
DRILLED BY : Mosa
PROFILED BY : CS Morgan

INCLINATION : Vertical
DIAM : 0.75m
DATE : 6 May 2024
DATE : 6 May 2024

ELEVATION :
X-COORD :
Y-COORD :

TYPE SET BY : KG
SETUP FILE : DPL.SET

DATE : 05/06/2024 11:16
TEXT : ..\GGE24009Bultfontein.txt

HOLE No: TP08

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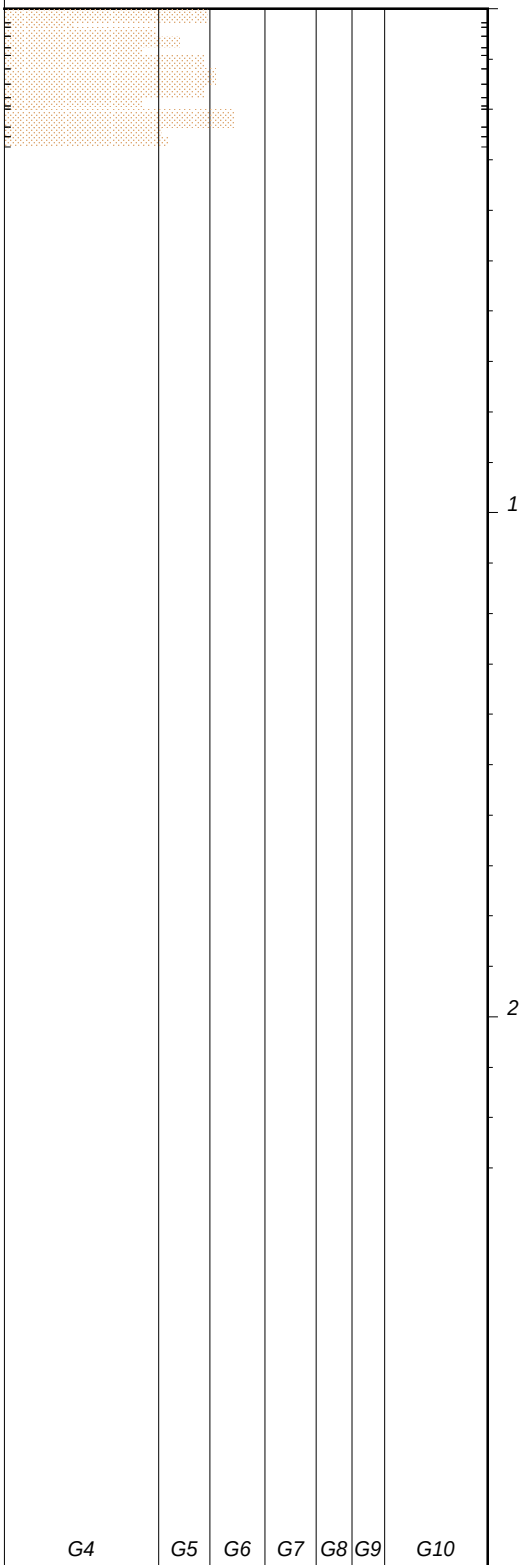
LANSERIA EXTENSION 81
Ptn of Ptn 2 of the Farm Bultfontein 533-IQ
Corpclo 1482 (Pty) Ltd

HOLE No: **TP09**
Sheet 1 of 1

JOB NUMBER: GGE/24009

Scale 1:15



0.00	Dry to slightly moist, brown, medium dense, porous, silty sand. HILLWASH
0.25	Slightly moist to moist, reddish-orange blotched brown, medium dense, porous, silty sand, with abundant sub-rounded quartz gravels and cobbles. PEBBLE MARKER
0.90	Slightly moist, reddish-orange blotched dusky-red and brown, medium dense, porous, clayey sand, with scattered quartz veins. ALTERED REWORKED RESIDUAL GRANITE
1.70	Slightly moist, olive-green pale orange pale yellow and dusky-red, medium dense to dense, intact and relict-structured, silty sand. RESIDUAL GRANITE
2.30	End of hole at nominal refusal - continues as above.

NOTES

1) Stable test pit sidewalls.
2) No groundwater proven in depth of excavation.
3) No samples taken.

CONTRACTOR : HireAll
MACHINE : JCB.3CX
DRILLED BY : Mosa
PROFILED BY : CS Morgan

TYPE SET BY : KG
SETUP FILE : DPL.SET

INCLINATION : Vertical
DIAM : 0.75m
DATE : 6 May 2024
DATE : 6 May 2024

DATE : 05/06/2024 11:16
TEXT : ..\GGE24009Bultfontein.txt

ELEVATION :
X-COORD :
Y-COORD :

HOLE No: **TP09**

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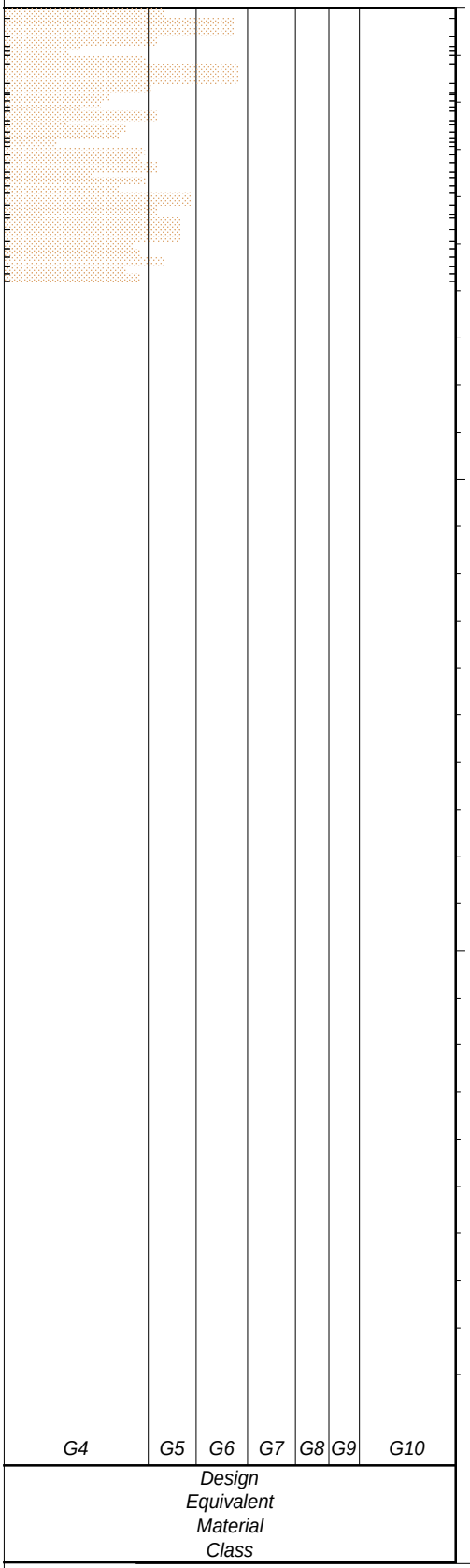
LANSERIA EXTENSION 81
Ptn of Ptn 2 of the Farm Bultfontein 533-IQ
Corpclo 1482 (Pty) Ltd

HOLE No: **TP10**
Sheet 1 of 1

JOB NUMBER: GGE/24009



0.00

Abundant sub-angular quartz gravel and cobbles in a matrix of dry to slightly moist, light brown, medium dense, porous, silty sand.

PEBBLE MARKER

0.70

Slightly moist, reddish-orange blotched off-white, medium dense, porous, clayey silty sand, with pockets of angular quartz and pegmatite.

REWORKED RESIDUAL GRANITE

2.15

Slightly moist, light orange pale yellow and dusky-red, medium dense, porous, leached, silty sand.

RESIDUAL GRANITE

2.85

End of hole not at refusal - continues as above.

NOTES

1) Rock outcrop located 20m from TP10.
2) Stable test pit sidewalls.
3) No groundwater proven in depth of excavation.
4) No samples taken.

CONTRACTOR : HireAll
MACHINE : JCB.3CX
DRILLED BY : Mosa
PROFILED BY : CS Morgan

TYPE SET BY : KG
SETUP FILE : DPL.SET

INCLINATION : Vertical
DIAM : 0.75m
DATE : 6 May 2024
DATE : 6 May 2024

DATE : 05/06/2024 11:16
TEXT : ..\GGE24009Bultfontein.txt

ELEVATION :
X-COORD :
Y-COORD :

HOLE No: **TP10**

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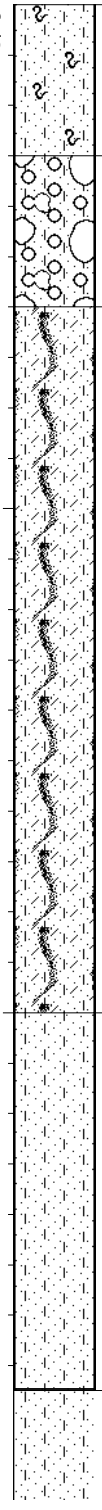
LANSERIA EXTENSION 81
Ptn of Ptn 2 of the Farm Bultfontein 533-IQ
Corpclo 1482 (Pty) Ltd

HOLE No: **TP11**
Sheet 1 of 1

JOB NUMBER: GGE/24009

Scale 1:15



0.00	Slightly moist, greyish-brown, medium dense, porous, silty sand; roots. HILLWASH
0.30	Abundant sub-rounded clast-supported gravel and cobbles in a matrix of slightly moist, brown blotched off-white and orange, medium dense, porous, silty sand. PEBBLE MARKER
0.60	Slightly moist to moist, dusky-red blotched brown spotted black, medium dense, partially intact and relict-structured, clayey silty sand, with deep leached runnels. REWORKED RESIDUAL GRANITE
2.00	Slightly moist to moist, reddish-orange speckled dusky-red pale yellow green and silver, medium dense, intact and relict-structured, silty sand. RESIDUAL GRANITE
2.75	End of hole not at refusal - continues as above.

NOTES

1) TP11 is 8m in from fence line.
2) Stable test pit sidewalls.
3) No groundwater proven in depth of excavation.
4) No samples taken.

G4	G5	G6	G7	G8	G9	G10

Design Equivalent Material Class

CONTRACTOR : HireAll
MACHINE : JCB.3CX
DRILLED BY : Mosa
PROFILED BY : CS Morgan

INCLINATION : Vertical
DIAM : 0.75m
DATE : 6 May 2024
DATE : 6 May 2024

ELEVATION :
X-COORD :
Y-COORD :

HOLE No: **TP11**

TYPE SET BY : KG
SETUP FILE : DPL.SET

DATE : 05/06/2024 11:16
TEXT : ..\GGE24009Bultfontein.txt

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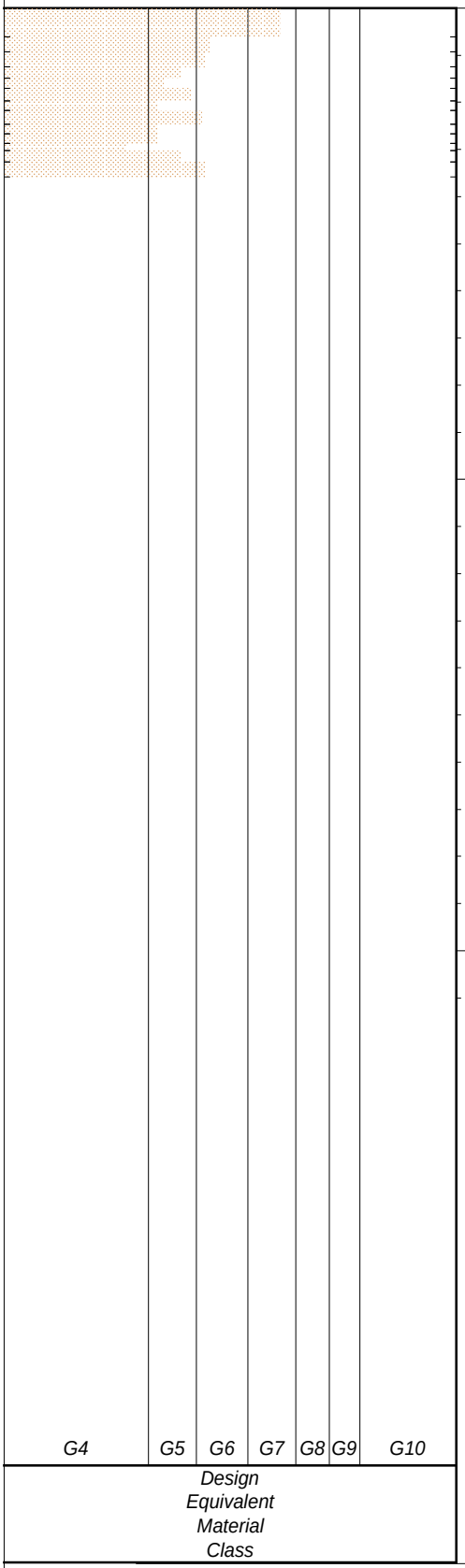
LANSERIA EXTENSION 81
Ptn of Ptn 2 of the Farm Bultfontein 533-IQ
Corpclo 1482 (Pty) Ltd

HOLE No: **TP12**
Sheet 1 of 1

JOB NUMBER: GGE/24009

Scale 1:15



0.00

Abundant clast-supported sub-rounded gravel in a matrix of dry to slightly moist, greyish-brown, medium dense, porous, silty sand.

PEBBLE MARKER

0.50

Slightly moist to moist, dull reddish-orange blotched mustard yellow ad pale grey, medium dense to dense, clayey silty sand; becoming loose with depth.

ALTERED REWORKED RESIDUAL GRANITE

1.60

Slightly moist to moist, dusky-red blotched pale grey speckled silver, firm, sandy clayey silt.

ALTERED REWORKED RESIDUAL GRANITE GNEISS

2.05

End of hole not at refusal - continues as above.

NOTES

1) Stable test pit sidewalls.
2) No groundwater proven in depth of excavation.
3) No samples taken.

CONTRACTOR : HireAll
MACHINE : JCB.3CX
DRILLED BY : Mosa
PROFILED BY : CS Morgan

INCLINATION : Vertical
DIAM : 0.75m
DATE : 6 May 2024
DATE : 6 May 2024

ELEVATION :
X-COORD :
Y-COORD :

HOLE No: **TP12**

TYPE SET BY : KG
SETUP FILE : DPL.SET

DATE : 05/06/2024 11:16
TEXT : ..\GGE24009Bultfontein.txt

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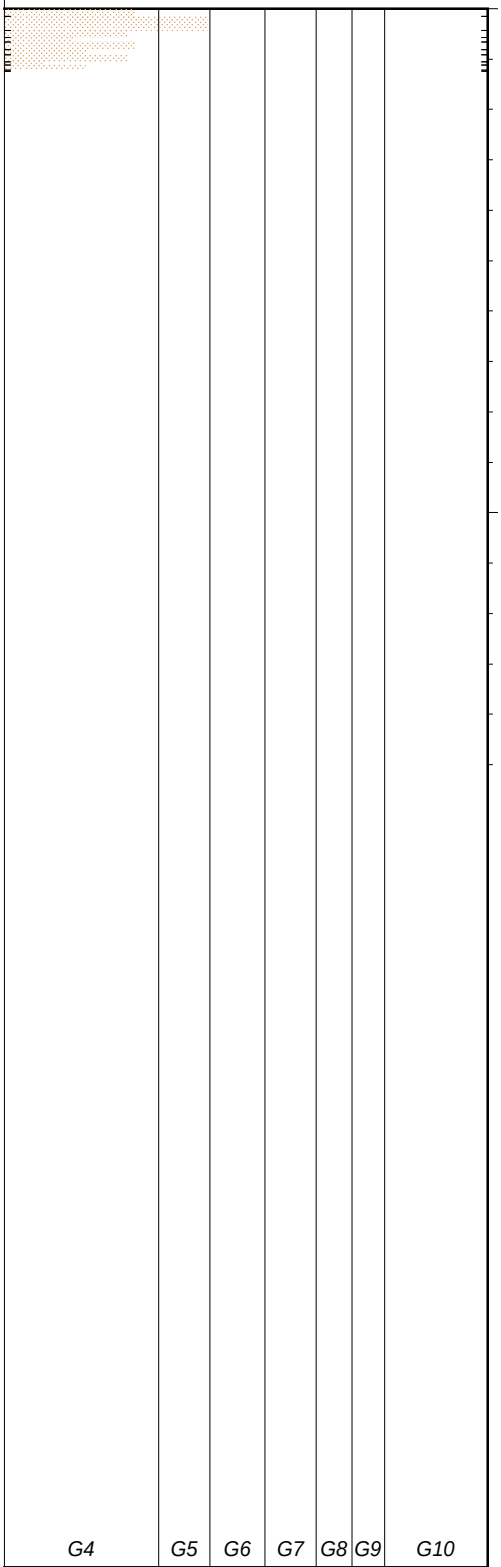
LANSERIA EXTENSION 81
Ptn of Ptn 2 of the Farm Bultfontein 533-IQ
Corpclo 1482 (Pty) Ltd

HOLE No: **TP13**
Sheet 1 of 1

JOB NUMBER: GGE/24009



0.00	Dry to slightly moist, greyish-brown, medium dense, porous, silty sand, with abundant sub-angular gravel.
	PEBBLE MARKER
0.20	Slightly moist, reddish-orange blotched pale yellow medium brown, dense, partially intact and relict-structured, silty sand, with loose runnels and quartz veins.
	REWORKED RESIDUAL GRANITE
1.10	Moist, dark grey blotched medium brown, firm, slightly slickensided, silty clay.
	REWORKED RESIDUAL DIABASE
1.50	End of hole at abrupt refusal on off-white mottled pale orange, highly weathered, soft rock, GRANITE.

NOTES

1) Stable test pit sidewalls.
2) No groundwater proven in depth of excavation.
3) Bulk sample B13/1 taken from 1.1m--1.5m.
4) Disturbed sample D13/1 taken from 1.1m--1.5m.

G4	G5	G6	G7	G8	G9	G10
Design Equivalent Material Class						

CONTRACTOR : HireAll
MACHINE : JCB.3CX
DRILLED BY : Mosa
PROFILED BY : CS Morgan

TYPE SET BY : KG
SETUP FILE : DPL.SET

INCLINATION : Vertical
DIAM : 0.75m
DATE : 6 May 2024
DATE : 6 May 2024

DATE : 05/06/2024 11:16
TEXT : ..\GGE24009Bultfontein.txt

ELEVATION :
X-COORD :
Y-COORD :

HOLE No: **TP13**

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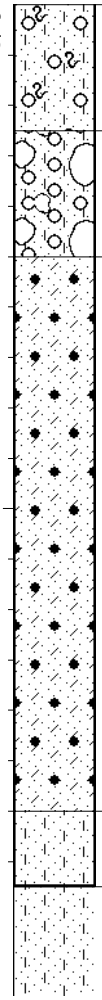
LANSERIA EXTENSION 81
Ptn of Ptn 2 of the Farm Bultfontein 533-IQ
Corpclo 1482 (Pty) Ltd

HOLE No: **TP14**
Sheet 1 of 1

JOB NUMBER: GGE/24009

Scale 1:15



0.00	Slightly moist to dry, greyish-brown, loose, porous, silty sand, with scattered gravel; roots.
	HILLWASH
0.25	Slightly moist to moist, medium brown, medium dense, porous, silty sand, with abundant sub-rounded quartz cobbles.
	PEBBLE MARKER
0.50	Moist, pale yellow blotched pale grey reddish-orange and brown, medium dense, partially intact and relict-structured, highly leached, clayey sand, with weak ferricrete.
	REWORKED RESIDUAL GRANITE
1.60	Slightly moist to moist, reddish-orange speckled grey and silver, dense, intact and relict-structured, micaceous silty sand.
	RESIDUAL GRANITE
1.75	End of hole at nominal refusal, RESIDUAL GRANITE.

NOTES

1) Stable test pit sidewalls.
2) No groundwater proven in depth of excavation.
3) No samples taken.

G4	*G5*	*G6*	*G7*	*G8*	*G9*	*G10*
Design Equivalent Material Class						

CONTRACTOR : HireAll
MACHINE : JCB.3CX
DRILLED BY : Mosa
PROFILED BY : CS Morgan

INCLINATION : Vertical
DIAM : 0.75m
DATE : 6 May 2024
DATE : 6 May 2024

ELEVATION :
X-COORD :
Y-COORD :

HOLE No: **TP14**

TYPE SET BY : KG
SETUP FILE : DPL.SET

DATE : 05/06/2024 11:16
TEXT : ..\GGE24009Bultfontein.txt

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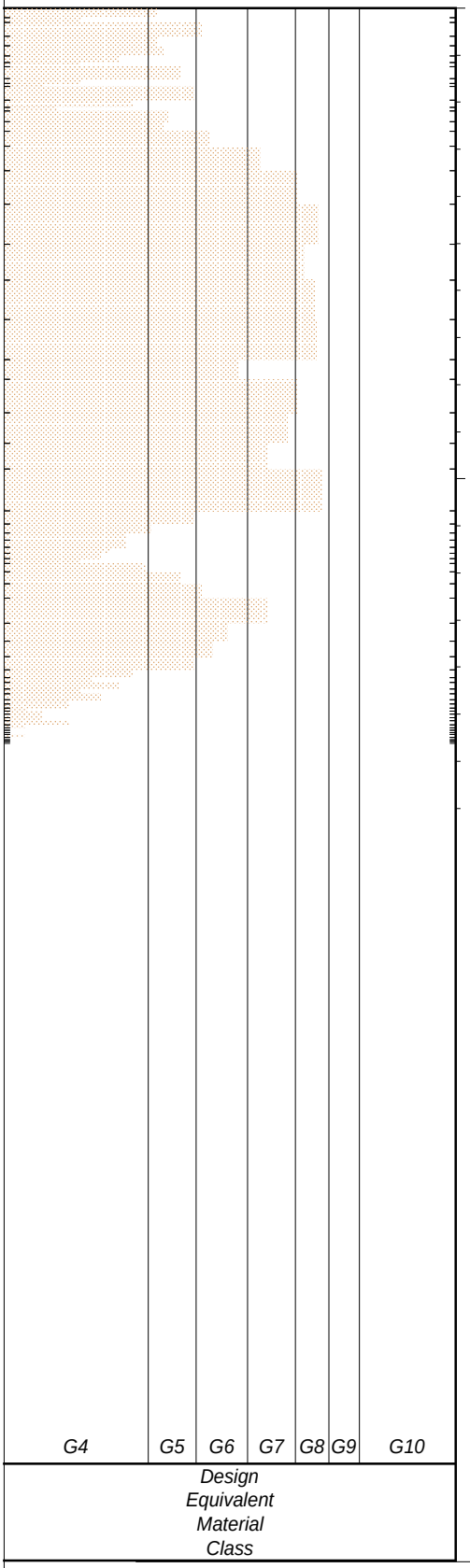
LANSERIA EXTENSION 81
Ptn of Ptn 2 of the Farm Bultfontein 533-IQ
Corpclo 1482 (Pty) Ltd

HOLE No: **TP15**
Sheet 1 of 1

JOB NUMBER: GGE/24009



0.00	Dry to slightly moist, greyish-brown, loose, porous, silty sand.
	HILLWASH
0.10	Abundant sub-angula quartz gravel and cobbles in a matrix of dry to slightly moist, greyish-brown, medium dense, silty sand.
	PEBBLE MARKER
0.25	Moist, yellowish-orange blotched mustard-yellow black and greyish-brown, medium dense, partially intact and relict-structured, clayey silty sand, with chunks of partially decomposed rock.
	REWORKED RESIDUAL GRANITE
1.45	Slightly moist to moist, reddish-orange speckled yellow and black, dense to very dense, intact and relict-structured, silty sand.
	RESIDUAL GRANITE
1.70	End of hole at refusal on dark grey speckled orange, highly weathered soft rock, GRANITE-GNEISS.

NOTES

1) Stable test pit sidewalls.
2) No groundwater proven in depth of excavation.
3) No samples taken.

CONTRACTOR : HireAll
MACHINE : JCB.3CX
DRILLED BY : Mosa
PROFILED BY : CS Morgan

INCLINATION : Vertical
DIAM : 0.75m
DATE : 6 May 2024
DATE : 6 May 2024

ELEVATION :
X-COORD :
Y-COORD :

HOLE No: **TP15**

TYPE SET BY : KG
SETUP FILE : DPL.SET

DATE : 05/06/2024 11:16
TEXT : ..\GGE24009Bultfontein.txt

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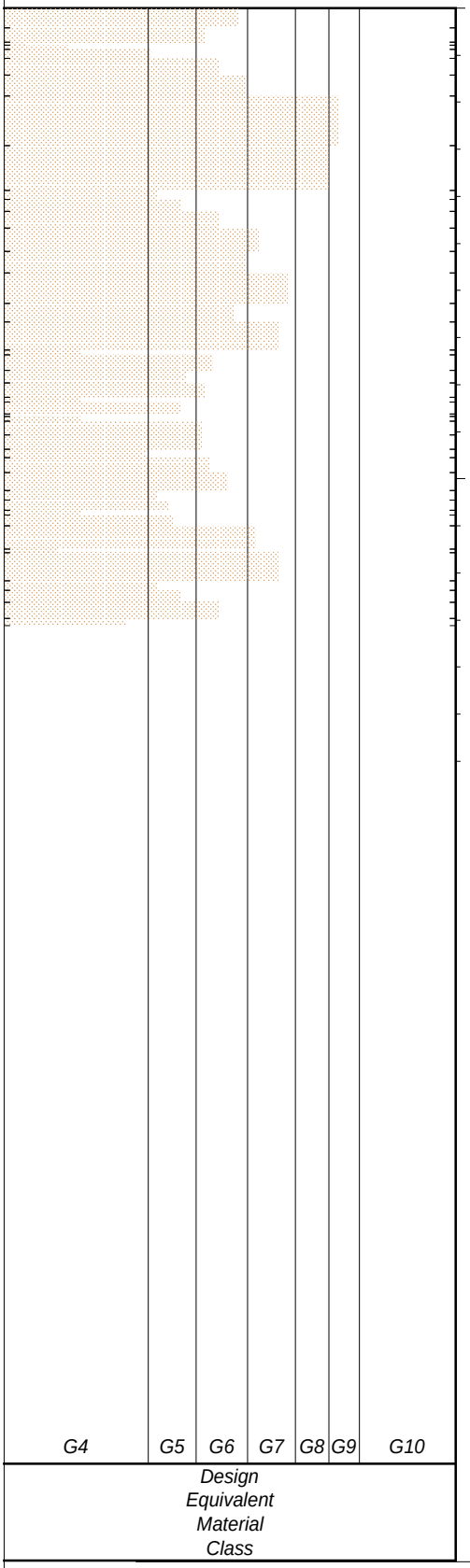
LANSERIA EXTENSION 81
Ptn of Ptn 2 of the Farm Bultfontein 533-IQ
Corpclo 1482 (Pty) Ltd

HOLE No: **TP16**
Sheet 1 of 1

JOB NUMBER: GGE/24009

Scale 1:15



0.00	Slightly moist, medium brown, loose, porous, silty sand.
	HILLWASH
0.25	Moist, medium brown blotched black and dusky-red, loose to medium dense, porous, clayey sand, with abundant sub-rounded quartz gravel and weak ferricrete.
	PEBBLE MARKER
0.60	Slightly moist to moist, yellowish-orange blotched pale grey and black, medium dense to dense, highly leached, partially intact and relict-structured, clayey sand, with scattered weak ferricrete.
	FERRUGINOUS REWORKED RESIDUAL GRANITE
1.50	Slightly moist, reddish-orange speckled olive-green and pale orange, dense, intact and relict-structured, friable, silty sand.
	RESIDUAL GRANITE
1.60	End of hole at refusal on very dense, silty sand with traces of very soft rock, RESIDUAL GRANITE.

NOTES

1) Stable test pit sidewalls.
2) No groundwater proven in depth of excavation.
3) No samples taken.

CONTRACTOR : HireAll
MACHINE : JCB.3CX
DRILLED BY : Mosa
PROFILED BY : CS Morgan

TYPE SET BY : KG
SETUP FILE : DPL.SET

INCLINATION : Vertical
DIAM : 0.75m
DATE : 6 May 2024
DATE : 6 May 2024

DATE : 05/06/2024 11:16
TEXT : ..\GGE24009Bultfontein.txt

ELEVATION :
X-COORD :
Y-COORD :

HOLE No: **TP16**

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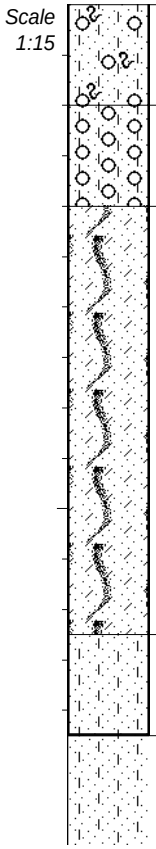
LANSERIA EXTENSION 81
Ptn of Ptn 2 of the Farm Bultfontein 533-IQ
Corpclo 1482 (Pty) Ltd

HOLE No: **TP17**
Sheet 1 of 1

JOB NUMBER: GGE/24009



0.00 – 0.20	Slightly moist, light brown, loose, porous, silty sand, with scattered gravel and roots. HILLWASH
0.20 – 0.40	Slightly moist, medium brown blotched reddish-orange, loose to medium dense, porous, silty sand, with abundant sub-angular gravel. PEBBLE MARKER
0.40 – 1.25	Slightly moist to moist, yellowish-orange blotched light grey black and reddish-orange, medium dense, with loose runnels, highly leached, partially intact and relict-structured, clayey sand. REWORKED RESIDUAL GRANITE
1.25 – 1.45	Slightly moist, reddish-orange speckled pale orange dark green and black, dense, intact and relict-structured, micaceous silty sand. RESIDUAL GRANITE
1.45	End of hole at refusal on very dense, RESIDUAL GRANITE.

NOTES

1) Stable test pit sidewalls.
2) No groundwater proven in depth of excavation.
3) No samples taken.

G4	G5	G6	G7	G8	G9	G10
Design Equivalent Material Class						

CONTRACTOR : HireAll
MACHINE : JCB.3CX
DRILLED BY : Mosa
PROFILED BY : CS Morgan

TYPE SET BY : KG
SETUP FILE : DPL.SET

INCLINATION : Vertical
DIAM : 0.75m
DATE : 6 May 2024
DATE : 6 May 2024

DATE : 05/06/2024 11:16
TEXT : ..\GGE24009Bultfontein.txt

ELEVATION :
X-COORD :
Y-COORD :

HOLE No: **TP17**

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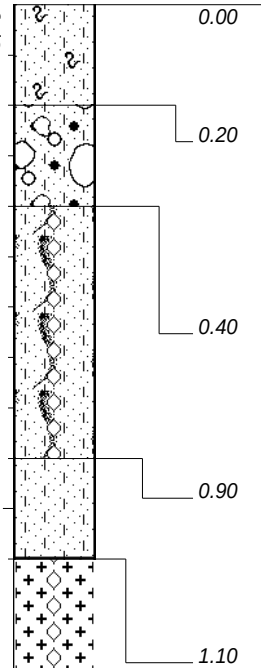
LANSERIA EXTENSION 81
Ptn of Ptn 2 of the Farm Bultfontein 533-IQ
Corpclo 1482 (Pty) Ltd

HOLE No: **TP18**
Sheet 1 of 1

JOB NUMBER: GGE/24009

Scale 1:15



Dry to slightly moist, greyish-brown, loose, porous, silty sand; roots.

HILLWASH

Moist, medium brown spotted black and reddish-orange, medium dense, porous, silty sand, with scattered sub-angular quarts gravel and cobbles, with traces of ferricrete.

FERRUGINOUS PEBBLE MARKER

Moist, mustard-yellow blotched black grey and pale yellow, overall medium dense, silty sand, with chunks of very soft rock and loose leached runnels.

REWORKED RESIDUAL GRANITE

Slightly moist to moist, pale orange speckled pale yellow and olive-green, dense, intact and relict-structured, friable, silty sand.

RESIDUAL GRANITE

End of hole at refusal on soft rock GRANITE.

NOTES

1) Stable test pit sidewalls.
2) No groundwater proven in depth of excavation.
3) No samples taken.

G4	G5	G6	G7	G8	G9	G10
Design Equivalent Material Class						

CONTRACTOR : HireAll
MACHINE : JCB.3CX
DRILLED BY : Mosa
PROFILED BY : CS Morgan

TYPE SET BY : KG
SETUP FILE : DPL.SET

INCLINATION : Vertical
DIAM : 0.75m
DATE : 6 May 2024
DATE : 6 May 2024

DATE : 05/06/2024 11:16
TEXT : ..\GGE24009Bultfontein.txt

ELEVATION :
X-COORD :
Y-COORD :

HOLE No: **TP18**

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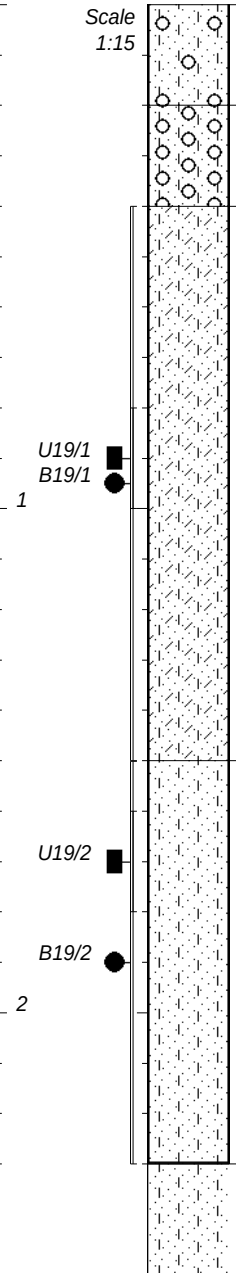
LANSERIA EXTENSION 81
Ptn of Ptn 2 of the Farm Bultfontein 533-IQ
Corpclo 1482 (Pty) Ltd

HOLE No: **TP19**
Sheet 1 of 1

JOB NUMBER: GGE/24009



0.00	Slightly moist, light greyish-brown, loose, porous, silty sand, with scattered gravel. HILLWASH
0.20	Abundant sub-angular and sub-rounded quartz gravel clast-supported in a matrix of moist, light brown, loose, porous, silty sand. PEBBLE MARKER
0.40	Moist, reddish-orange blotched pale grey, loose to medium dense, porous, partially intact, leached, clayey silty sand. REWORKED RESIDUAL GRANITE
1.50	Moist, reddish-orange speckled silver dark green and black, medium dense, becoming dense with depth, intact and relict-structured, micaceous silty sand. RESIDUAL GRANITE
2.30	End of hole not at refusal - continues as above.

NOTES

1) Stable test pit sidewalls.
2) No groundwater proven in depth of excavation.
3) Undisturbed sample U19/1 taken from 0.8m--1.0m.
4) Undisturbed sample U19/2 taken from 1.6m--1.8m.
5) Bulk sample B19/1 taken from 0.4m--1.5m.
6) Bulk sample B19/2 taken from 1.5--2.3m.

G4	*G5*	*G6*	*G7*	*G8*	*G9*	*G10*

Design Equivalent Material Class

CONTRACTOR : HireAll
MACHINE : JCB.3CX
DRILLED BY : Mosa
PROFILED BY : CS Morgan

TYPE SET BY : KG
SETUP FILE : DPL.SET

INCLINATION : Vertical
DIAM : 0.75m
DATE : 6 May 2024
DATE : 6 May 2024

DATE : 05/06/2024 11:16
TEXT : ..\GGE24009Bultfontein.txt

ELEVATION :
X-COORD :
Y-COORD :

HOLE No: **TP19**

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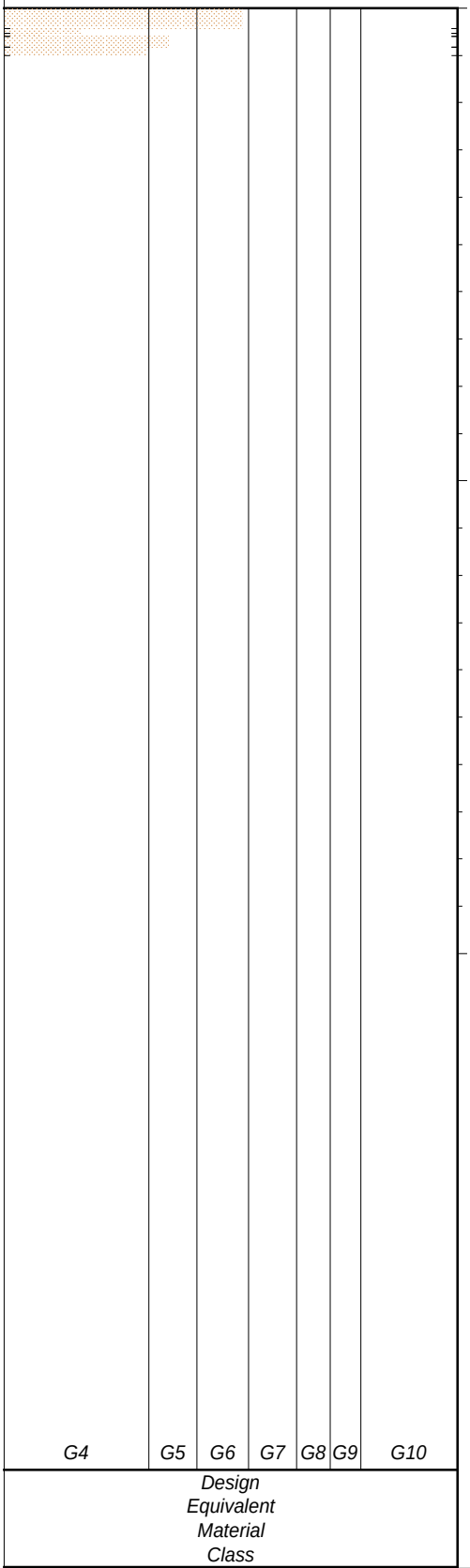
LANSERIA EXTENSION 81
Ptn of Ptn 2 of the Farm Bultfontein 533-IQ
Corpclo 1482 (Pty) Ltd

HOLE No: **TP20**
Sheet 1 of 1

JOB NUMBER: GGE/24009



0.00	Slightly moist, medium brown, loose, porous, silty sand. HILLWASH
0.10	Abundant sub-angular quartz gravel clast-supported in a matrix of moist, brown, loose, porous, silty sand. PEBBLE MARKER
0.30	Moist, reddish-orange blotched pale grey, medium dense with loose runnels, partially intact and relict-structured, clayey sand. REWORKED RESIDUAL GRANITE
1.50	Moist, reddish-orange mottled dusky-red speckled green and silver, medium dense, intact and relict-structured, micaceous silty sand. RESIDUAL GRANITE
2.00	End of hole at partial refusal on very soft rock, GRANITE.

NOTES

1) Stable test pit sidewalls.
2) No groundwater proven in depth of excavation.
3) Bulk sample B20/1 taken from 0.1m--0.3m.

CONTRACTOR : HireAll
MACHINE : JCB.3CX
DRILLED BY : Mosa
PROFILED BY : CS Morgan

TYPE SET BY : KG
SETUP FILE : DPL.SET

INCLINATION : Vertical
DIAM : 0.75m
DATE : 6 May 2024
DATE : 6 May 2024

DATE : 05/06/2024 11:16
TEXT : ..\GGE24009Bultfontein.txt

ELEVATION :
X-COORD :
Y-COORD :

HOLE No: **TP20**

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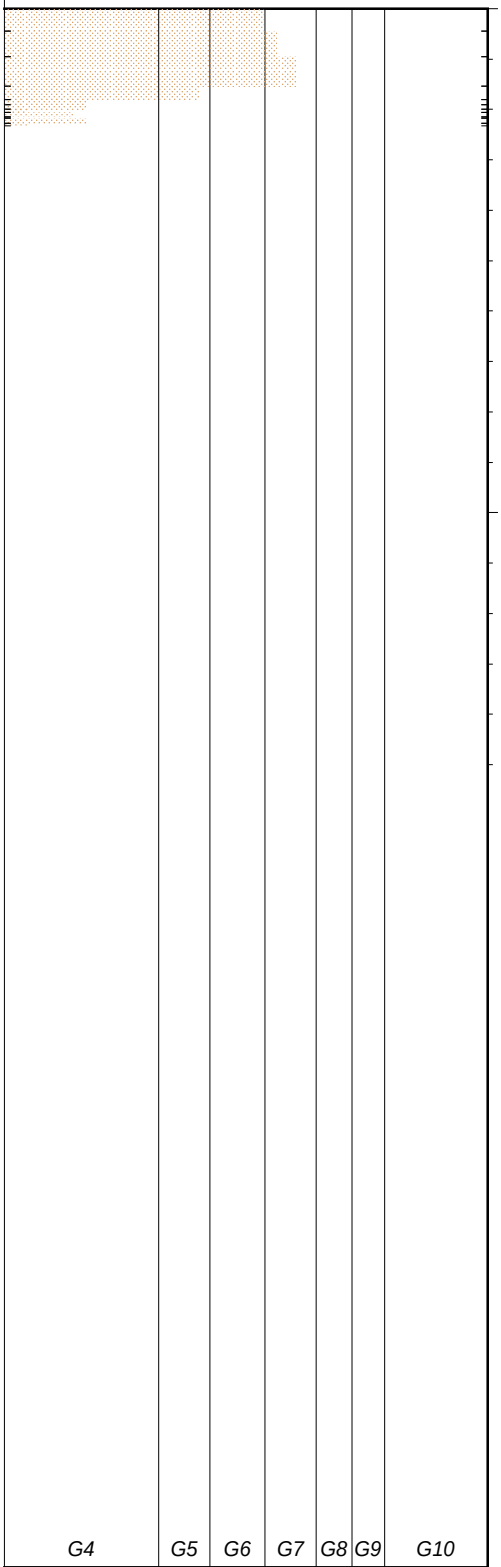
LANSERIA EXTENSION 81
Ptn of Ptn 2 of the Farm Bultfontein 533-IQ
Corpclo 1482 (Pty) Ltd

HOLE No: **TP21**
Sheet 1 of 1

JOB NUMBER: GGE/24009



0.00	Slightly moist, greyish-brown, loose, porous, silty sand; roots.
	HILLWASH
0.20	Abundant sub-rounded quartz cobbles in a matrix of slightly moist, medium brown, medium dense, silty sand.
	PEBBLE MARKER
0.40	Slightly moist, reddish-orange mottled mustard-yellow blotched black and pale brown, medium dense, leached, partially intact and relict-structured, silty sand, with pockets of pegmatite.
	REWORKED RESIDUAL GRANITE
1.20	Slightly moist to moist, pinkish-red speckled black and off-white, medium dense to dense, largely intact and relict-structured, silty sand.
	RESIDUAL GRANITE
1.50	End of hole at nominal refusal on slightly sheared very soft rock, GRANITE.

NOTES

1) Stable test pit sidewalls.
2) No groundwater proven in depth of excavation.
3) No samples taken.

CONTRACTOR : HireAll
MACHINE : JCB.3CX
DRILLED BY : Mosa
PROFILED BY : CS Morgan

TYPE SET BY : KG
SETUP FILE : DPL.SET

INCLINATION : Vertical
DIAM : 0.75m
DATE : 6 May 2024
DATE : 6 May 2024

DATE : 05/06/2024 11:16
TEXT : ..\GGE24009Bultfontein.txt

ELEVATION :
X-COORD :
Y-COORD :

HOLE No: **TP21**

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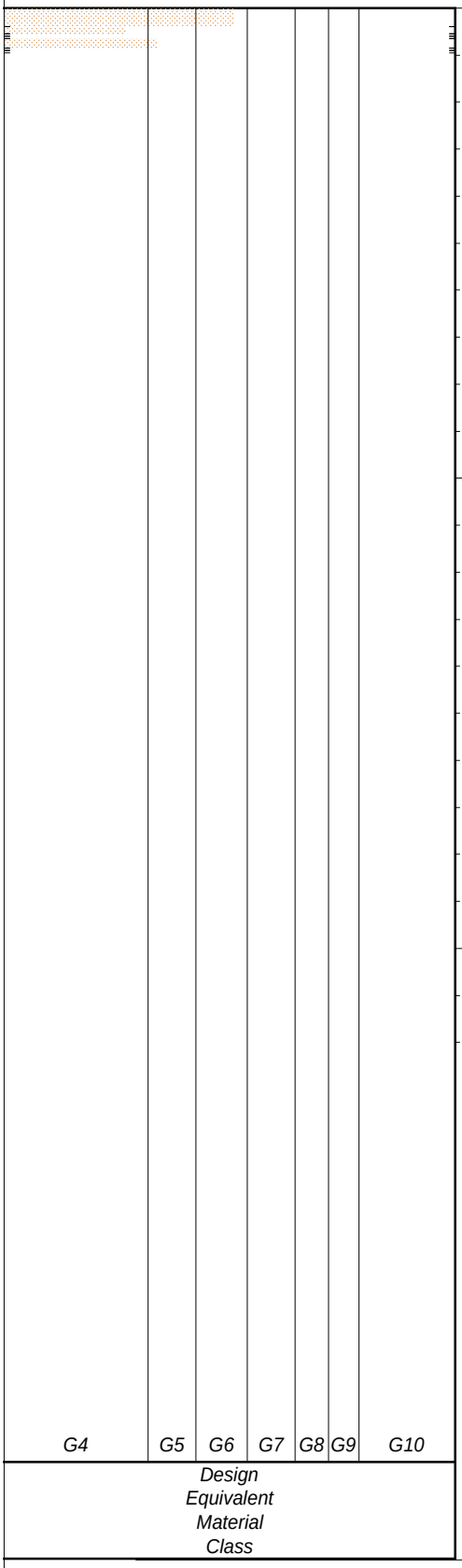
LANSERIA EXTENSION 81
Ptn of Ptn 2 of the Farm Bultfontein 533-IQ
Corpclo 1482 (Pty) Ltd

HOLE No: **TP22**
Sheet 1 of 1

JOB NUMBER: GGE/24009



0.00	Slightly moist, greyish-brown, loose, porous, silty sand. HILLWASH
0.20	Moist, greyish-brown blotched dusky-red and black, loose to medium dense, porous, silty sand, hosting abundant sub-angular quartz gravel and ferricrete nodules. FERRUGINOUS PEBBLE MARKER
0.75	Moist, pale yellow mottled pinkish-red speckled green and silver blotched grey, medium dense, partially intact and relict-structured, silty sand, with clay seams and pegmatite veins. REWORKED RESIDUAL GRANITE
1.20	Slightly moist to moist, light orange speckled dark green and silver, medium dense, intact and relict-structured, silty sand. RESIDUAL GRANITE
2.20	End of hole at nominal refusal on RESIDUAL GRANITE.

NOTES

1) Stable test pit sidewalls.
2) No groundwater proven in depth of excavation.
3) Undisturbed sample U22/1 taken from 1.2m--1.4m.

CONTRACTOR : HireAll
MACHINE : JCB.3CX
DRILLED BY : Mosa
PROFILED BY : CS Morgan

TYPE SET BY : KG
SETUP FILE : DPL.SET

INCLINATION : Vertical
DIAM : 0.75m
DATE : 6 May 2024
DATE : 6 May 2024

DATE : 05/06/2024 11:16
TEXT : ..\GGE24009Bultfontein.txt

ELEVATION :
X-COORD :
Y-COORD :

HOLE No: **TP22**

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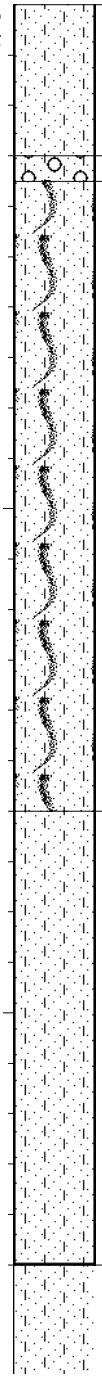
LANSERIA EXTENSION 81
Ptn of Ptn 2 of the Farm Bultfontein 533-IQ
Corpclo 1482 (Pty) Ltd

HOLE No: **TP23**
Sheet 1 of 1

JOB NUMBER: GGE/24009

Scale 1:15



0.00	Slightly moist to moist, greyish-brown, loose, porous, silty sand.
	HILLWASH
0.30	
	Slightly moist to moist, greyish-brown, loose, porous, silty sand, with abundant sub-angular quartz gravel.
	PEBBLE MARKER
0.35	
	Dry to slightly moist, reddish-orange blotched mustard-yellow black and medium grey, medium dense to dense, partially intact and relict-structured, silty sand, with pockets of pegmatite and loose runnels.
	REWORKED RESIDUAL GRANITE
1.60	
	Slightly moist to moist, pinkish-red speckled silver and olive-green, medium dense, intact and relict-structured, micaceous silty sand.
	RESIDUAL GRANITE
2.50	
	End of hole at nominal refusal on RESIDUAL GRANITE.

NOTES

1) Test pit flag lost - accidentally moved 23m from industrial park fence.
2) Stable test pit sidewalls.
3) No groundwater proven in depth of excavation.
4) No samples taken.

G4	*G5*	*G6*	*G7*	*G8*	*G9*	*G10*
Design Equivalent Material Class						

CONTRACTOR : HireAll
MACHINE : JCB.3CX
DRILLED BY : Mosa
PROFILED BY : CS Morgan

TYPE SET BY : KG
SETUP FILE : DPL.SET

INCLINATION : Vertical
DIAM : 0.75m
DATE : 6 May 2024
DATE : 6 May 2024

DATE : 05/06/2024 11:16
TEXT : ..\GGE24009Bultfontein.txt

ELEVATION :
X-COORD :
Y-COORD :

HOLE No: **TP23**

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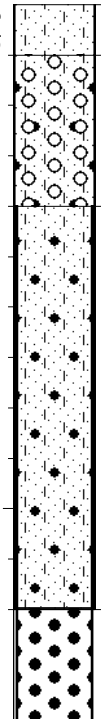
LANSERIA EXTENSION 81
Ptn of Ptn 2 of the Farm Bultfontein 533-IQ
Corpclo 1482 (Pty) Ltd

HOLE No: **TP24**
Sheet 1 of 1

JOB NUMBER: GGE/24009

Scale 1:15



0.00	Dry to slightly moist, greyish-brown, loose, porous, silty sand.
	HILLWASH
0.10	Abundant sub-angular quartz gravel clast-supported in a matrix of slightly moist, brown blotched reddish-orange and black, medium dense, porous, silty sand.
	FERRUGINOUS PEBBLE MARKER
0.40	Slightly moist to moist, reddish-orange blotched mustard-yellow black and pale grey, medium dense to dense, leached and re-cemented, silty sand, with weak ferricrete
	FERRUGINOUS REWORKED RESIDUAL GRANITE
1.20	End of hole at refusal on HARDPAN FERRICRETE.

NOTES

1) Stable test pit sidewalls.
2) No groundwater proven in depth of excavation.
3) No samples taken.

G4	*G5*	*G6*	*G7*	*G8*	*G9*	*G10*
Design Equivalent Material Class						

CONTRACTOR : HireAll
MACHINE : JCB.3CX
DRILLED BY : Mosa
PROFILED BY : CS Morgan

TYPE SET BY : KG
SETUP FILE : DPL.SET

INCLINATION : Vertical
DIAM : 0.75m
DATE : 6 May 2024
DATE : 6 May 2024

DATE : 05/06/2024 11:16
TEXT : ..\GGE24009Bultfontein.txt

ELEVATION :
X-COORD :
Y-COORD :

HOLE No: **TP24**

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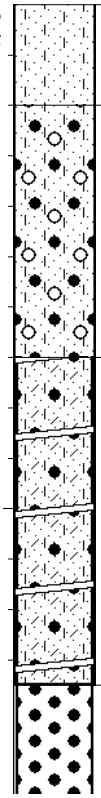
LANSERIA EXTENSION 81
Ptn of Ptn 2 of the Farm Bultfontein 533-IQ
Corpclo 1482 (Pty) Ltd

HOLE No: **TP25**
Sheet 1 of 1

JOB NUMBER: GGE/24009



0.00	Dry to slightly moist, greyish-brown, loose, porous, silty sand. HILLWASH
0.20	Slightly moist, greyish-brown blotched mustard-red black and orange, medium dense to dense, porous, silty sand, with abundant ferricrete nodules and scattered quartz gravel. FERRUGINOUS PEBBLE MARKER
0.70	Dry to slightly moist, mustard-orange becoming mustard-yellow blotched black and pale grey, medium dense to dense, leached and re-cemented, slightly clayey silty sand, with clay seams. FERRUGINOUS REWORKED RESIDUAL GRANITE
1.35	End of hole at refusal on HARDPAN FERRICRETE.

NOTES

1) Stable test pit sidewalls.
2) No groundwater proven in depth of excavation.
3) No samples taken.

G4	G5	G6	G7	G8	G9	G10
Design Equivalent Material Class						

CONTRACTOR : HireAll
MACHINE : JCB.3CX
DRILLED BY : Mosa
PROFILED BY : CS Morgan

TYPE SET BY : KG
SETUP FILE : DPL.SET

INCLINATION : Vertical
DIAM : 0.75m
DATE : 6 May 2024
DATE : 6 May 2024

DATE : 05/06/2024 11:16
TEXT : ..\GGE24009Bultfontein.txt

ELEVATION :
X-COORD :
Y-COORD :

HOLE No: **TP25**

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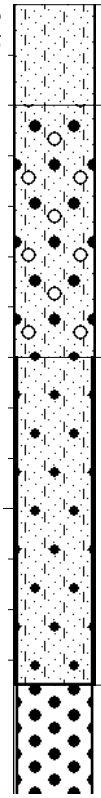
LANSERIA EXTENSION 81
Ptn of Ptn 2 of the Farm Bultfontein 533-IQ
Corpclo 1482 (Pty) Ltd

HOLE No: **TP26**
Sheet 1 of 1

JOB NUMBER: GGE/24009

Scale 1:15



0.00	Dry to slightly moist, greyish-brown, loose, porous, silty sand.
	HILLWASH
0.20	Dry to slightly moist, pale grey blotched dusky-red and black, loose to medium dense, porous, leached, silty sand, with abundant ferricrete nodules and scattered quartz gravel.
	FERRUGINOUS PEBBLE MARKER
0.70	Slightly moist, reddish-orange mottled mustard-yellow blotched black and pale grey, dense to very dense, well cemented, silty sand.
	FERRUGINOUS RESIDUAL GRANITE
1.35	End of hole at refusal on HARDPAN FERRICRETE.

NOTES

1) Stable test pit sidewalls.
2) No groundwater proven in depth of excavation.
3) No samples taken.

G4	*G5*	*G6*	*G7*	*G8*	*G9*	*G10*
Design Equivalent Material Class						

CONTRACTOR : HireAll
MACHINE : JCB.3CX
DRILLED BY : Mosa
PROFILED BY : CS Morgan

TYPE SET BY : KG
SETUP FILE : DPL.SET

INCLINATION : Vertical
DIAM : 0.75m
DATE : 6 May 2024
DATE : 6 May 2024

DATE : 05/06/2024 11:16
TEXT : ..\GGE24009Bultfontein.txt

ELEVATION :
X-COORD :
Y-COORD :

HOLE No: **TP26**

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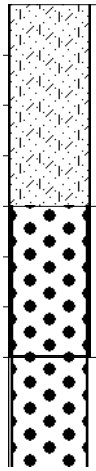
LANSERIA EXTENSION 81
Ptn of Ptn 2 of the Farm Bultfontein 533-IQ
Corpclo 1482 (Pty) Ltd

HOLE No: **TP27**
Sheet 1 of 1

JOB NUMBER: GGE/24009

Scale 1:15



0.00

Slightly moist, greyish-brown becoming yellowish-brown blotched mustard-yellow, loose to medium dense, porous, clayey silty sand.

HILLWASH

0.40

Dry to slightly moist, mustard-orange blotched mustard-red and pale grey, dense to very dense, hardpan ferricrete.

HARDPAN FERRICRETE

0.70

End of hole at refusal on HARDPAN FERRICRETE.

NOTES

1) Stable test pit sidewalls.

2) No groundwater proven in depth of excavation.

3) No samples taken.

G4	*G5*	*G6*	*G7*	*G8*	*G9*	*G10*
Design Equivalent Material Class						

CONTRACTOR : HireAll
MACHINE : JCB.3CX
DRILLED BY : Mosa
PROFILED BY : CS Morgan

TYPE SET BY : KG
SETUP FILE : DPL.SET

INCLINATION : Vertical
DIAM : 0.75m
DATE : 6 May 2024
DATE : 6 May 2024

DATE : 05/06/2024 11:16
TEXT : ..\GGE24009Bultfontein.txt

ELEVATION :
X-COORD :
Y-COORD :

HOLE No: **TP27**

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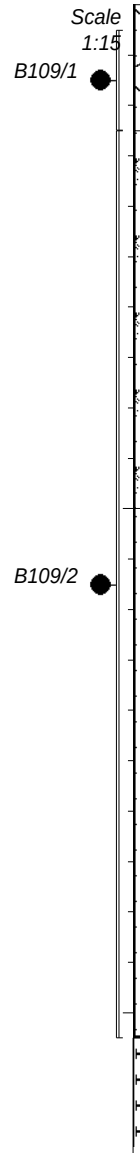
PORTION 72 OF THE FARM BULTFONTEIN 533
HIRE ALL - LANSERIA

HOLE No: **TP109**
Sheet 1 of 1

JOB NUMBER: **GGE/18005**



0.00

Dry to slightly moist, greyish-brown, medium dense, porous, silty sand with coarse sub-angular quartz gravel and cobbles; roots.

PEBBLE MARKER

0.25

Slightly moist, pinkish-orange blotched brown speckled yellow and off-white, medium dense to dense, largely intact and relict-structured, silty sand with loose runnels.

REWORKED RESIDUAL GRANITE

1.00

Slightly moist, olive green speckled off-white and silver stained pale orange, medium dense to dense, intact and relict-structured, very friable, micaceous silty sand.

RESIDUAL GRANITE

2.05

End of hole at refusal on very soft rock GRANITE.

NOTES

1) Stable test pit sidewalls.
2) No seepage or groundwater water evident.
3) Bulk sample B109/1 taken from 0.05m--0.25m.
4) Bulk sample B109/2 taken from 0.25m--2.05m.

CONTRACTOR : Hire All
MACHINE :
DRILLED BY :
PROFILED BY : CS Morgan

INCLINATION : Vertical
DIAM : 1.5m
DATE : 19 February 2018
DATE : 20 February 2018

ELEVATION :
X-COORD :
Y-COORD :

HOLE No: **TP109**

TYPE SET BY : CSM
SETUP FILE : STANDARD.SET

DATE : 21/02/2018 17:16
TEXT : ..005HireAllLanseriaTP.txt

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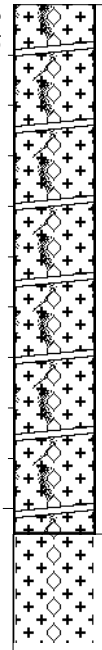
PORTION 72 OF THE FARM BULTFONTEIN 533
HIRE ALL - LANSERIA

HOLE No: **TP110**
Sheet 1 of 1

JOB NUMBER: GGE/18005

Scale 1:15



0.00

Off-white speckled pale orange stained brown, black and orange, moderately weathered, highly jointed and evidently sheared, soft rock with minor infill of silty sand.

SHEARED GRANITE

1.05

End of hole at refusal on soft rock sheared GRANITE.

NOTES

1) Stable test pit sidewalls.

2) No seepage or groundwater water evident.

3) No samples taken.

CONTRACTOR : Hire All
MACHINE :
DRILLED BY :
PROFILED BY : CS Morgan

INCLINATION :
DIAM : 1.5m
DATE : 19 February 2018
DATE : 20 February 2018

ELEVATION :
X-COORD :
Y-COORD :

HOLE No: **TP110**

TYPE SET BY : CSM
SETUP FILE : STANDARD.SET

DATE : 21/02/2018 17:16
TEXT : ..005HireAllLanseriaTP.txt

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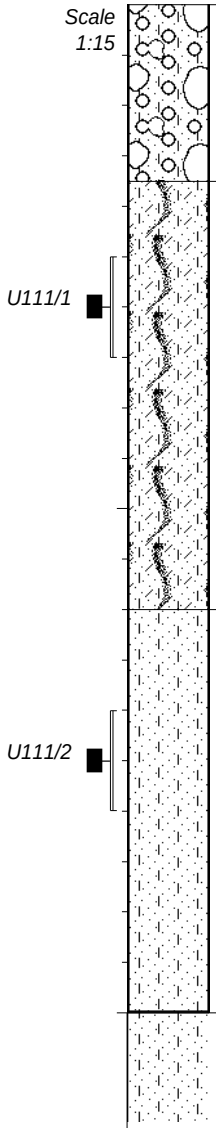
PORTION 72 OF THE FARM BULTFONTEIN 533
HIRE ALL - LANSERIA

HOLE No: **TP111**
Sheet 1 of 1

JOB NUMBER: **GGE/18005**

Scale 1:15



0.00

Dry to slightly moist, light greyish-brown, loose, porous, silty sand with abundant sub-rounded through sub-angular quartz gravel and cobbles.

PEBBLE MARKER

0.35

Slightly moist, pale yellow mottled reddish-orange blotched brown speckled off-white, medium dense, partially intact and relict-structured, slightly clayey silty sand with loose runnels.

REWORKED RESIDUAL GRANITE

1.20

Slightly moist, pinkish-orange speckled green and silver stained dusky-red and black, medium dense, intact and relict-structured, micaceous silty sand.

RESIDUAL GRANITE

2.00

End of hole at nominal refusal on dense RESIDUAL GRANITE.

NOTES

1) Stable test pit sidewalls.
2) No seepage or groundwater water evident.
3) Undisturbed sample U111/1 taken at 0.5m--0.7m.
4) Undisturbed sample U111/2 taken at 1.4m--1.6m.

CONTRACTOR : Hire All
MACHINE :
DRILLED BY :
PROFILED BY : CS Morgan
TYPE SET BY : CSM
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 1.5m
DATE : 19 February 2018
DATE : 20 February 2018
DATE : 21/02/2018 17:16
TEXT : ..005HireAllLanseriaTP.txt

ELEVATION :
X-COORD :
Y-COORD :

HOLE No: **TP111**

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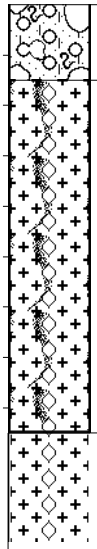
PORTION 72 OF THE FARM BULTFONTEIN 533
HIRE ALL - LANSERIA

HOLE No: **TP112**
Sheet 1 of 1

JOB NUMBER: **GGE/18005**

Scale 1:15



0.00 Dry to slightly moist, greyish-brown, medium dense, porous, silty sand with abundant sub-rounded quartz gravel and cobbles; roots.

PEBBLE MARKER

0.15 Pale yellow speckled off-white stained orange and black, highly weathered, very friable, jointed, soft rock with minor infill of silty sand.

GRANITE

0.85 End of hole at refusal on soft rock GRANITE.

NOTES

1) Stable test pit sidewalls.
2) No seepage or groundwater water evident.
3) No samples taken.

CONTRACTOR : Hire All
MACHINE :
DRILLED BY :
PROFILED BY : CS Morgan
TYPE SET BY : CSM
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 1.5m
DATE : 19 February 2018
DATE : 20 February 2018
DATE : 21/02/2018 17:17
TEXT : ..005HireAllLanseriaTP.txt

ELEVATION :
X-COORD :
Y-COORD :

HOLE No: **TP112**

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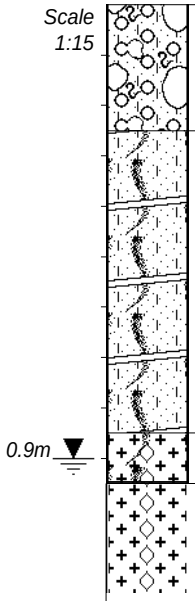
PORTION 72 OF THE FARM BULTFONTEIN 533
HIRE ALL - LANSERIA

HOLE No: **TP113**
Sheet 1 of 1

JOB NUMBER: **GGE/18005**

Scale 1:15



0.00

Abundant sub-angular quartz gravel and cobbles in a matrix of slightly moist, greyish-brown, loose, porous, silty sand with roots.

PEBBLE MARKER

0.25

Moist, yellowish-orange blotched grey, medium dense, partially intact, silty sand through very soft rock with loose runnels.

REWORKED RESIDUAL GRANITE

0.85

Off-white speckled black through pale yellow and off-white, highly weathered, very friable, silty sand through very soft rock.

RESIDUAL GRANITE

0.95

End of hole at refusal on evidently soft rock GRANITE.

NOTES

1) Unstable test pit sidewalls.
2) Standing water at 0.9m.
3) No samples taken.

CONTRACTOR : Hire All
MACHINE :
DRILLED BY :
PROFILED BY : CS Morgan

INCLINATION :
DIAM : 1.5m
DATE : 19 February 2018
DATE : 20 February 2018

ELEVATION :
X-COORD :
Y-COORD :

HOLE No: **TP113**

TYPE SET BY : CSM
SETUP FILE : STANDARD.SET

DATE : 21/02/2018 17:17
TEXT : ..005HireAllLanseriaTP.txt

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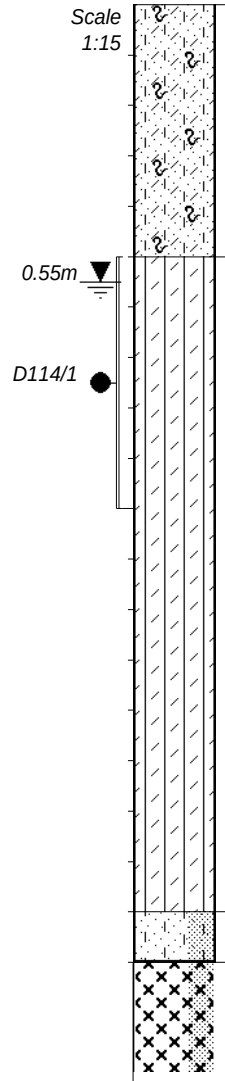
PORTION 72 OF THE FARM BULTFONTEIN 533
HIRE ALL - LANSERIA

HOLE No: **TP114**
Sheet 1 of 1

JOB NUMBER: **GGE/18005**



0.00

Slightly moist to most, dark greyish-brown, loose, porous, clayey silty sand with roots.

GULLYWASH

0.50

Moist through saturated, beige mottled grey and reddish-orange, soft, partially intact and relict-structured, clayey silt.

REWORKED RESIDUAL DIABASE

1.80

Pale pink speckled black and dark green, fissile, silty sand through very soft rock.

RESIDUAL DIABASE

1.90

End of hole assumed to be at refusal on very soft rock DIABASE.

NOTES

1) Masked by standing water - profiled from spoils heap.
2) Unstable test pit sidewalls.
3) Standing water at 0.55m.
4) Disturbed sample D114/1 taken around 0.5m--1.0m.

CONTRACTOR : Hire All
MACHINE :
DRILLED BY :
PROFILED BY : CS Morgan
TYPE SET BY : CSM
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 1.5m
DATE : 19 February 2018
DATE : 20 February 2018
DATE : 21/02/2018 17:17
TEXT : ..005HireAllLanseriaTP.txt

ELEVATION :
X-COORD :
Y-COORD :

HOLE No: **TP114**

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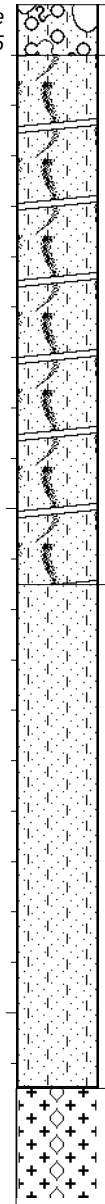
PORTION 72 OF THE FARM BULTFONTEIN 533
HIRE ALL - LANSERIA

HOLE No: **TP115**
Sheet 1 of 1

JOB NUMBER: **GGE/18005**

Scale 1:15



0.00

Abundant sub-rounded quartz gravel and cobbles in a matrix of slightly moist, greyish-brown, loose, porous, silty sand with roots.

PEBBLE MARKER

0.10

Slightly moist, reddish-orange mottled pale yellow blotched greyish-brown, dense to very dense, largely intact and relict-structured, silty sand with local deep runnels and pockets of soft rock.

REWORKED RESIDUAL GRANITE

1.15

Slightly moist, olive green speckled off-white and silver stained pale orange, medium dense to dense, intact, very friable, micaceous silty sand.

RESIDUAL GRANITE

2.15

End of hole at refusal on very soft rock GRANITE.

NOTES

1) Stable test pit sidewalls.

2) No seepage or groundwater water evident.

3) No samples taken.

CONTRACTOR : Hire All
MACHINE :
DRILLED BY :
PROFILED BY : CS Morgan

TYPE SET BY : CSM
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 1.5m
DATE : 19 February 2018
DATE : 20 February 2018

DATE : 21/02/2018 17:17
TEXT : ..005HireAllLanseriaTP.txt

ELEVATION :
X-COORD :
Y-COORD :

HOLE No: **TP115**

APPENDIX D

Laboratory Test Results

SOILS & MATERIALS TESTING
1164 Minnie Postma, Florida Ext 11
TEL: (011) 674 1325
e mail: lab@geopractica.co.za

FOUNDATION INDICATOR

Client	GEOID Geotechnical Engineers		
Location	Bultfontein TP 1 @ 1,0 - 1,2m		
Date	17-May-24	Test No	1769
Job No	24119	Checked By	EB

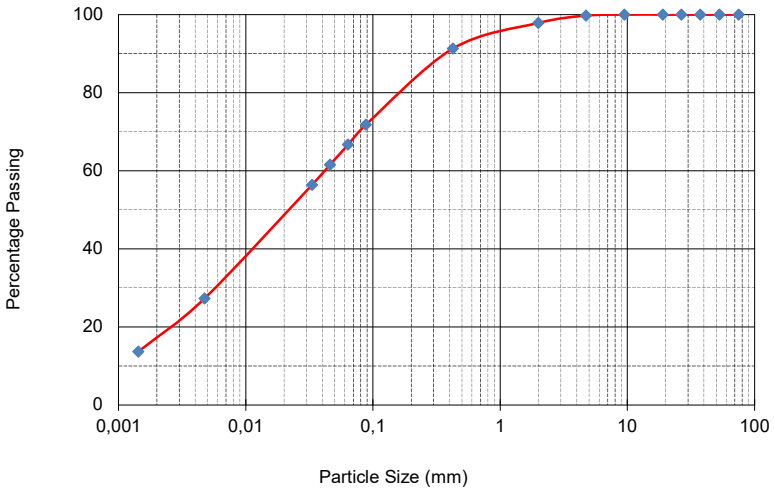
TEST DONE ACCORDING TO SANS & TMH METHODS

SIEVE ANALYSIS

Values are expressed as a percentage of total sample

Sieve Size (mm)	Total Passing (%)
75	100,00
53	100,00
37,5	100,00
26,5	100,00
19	100,00
9,5	100,00
4,75	99,72
2	97,85
0,425	91,30

GRADING ANALYSIS



HYDROMETER ANALYSIS

(TMH 1 Method A6)
Values are expressed as a percentage of total sample

Sieve Size (mm)	Total Passing (%)
0,0881	71,81
0,0637	66,68
0,0460	61,55
0,0332	56,42
0,0048	27,36
0,0014	13,68

ATTERBERG LIMITS & OTHER VALUES

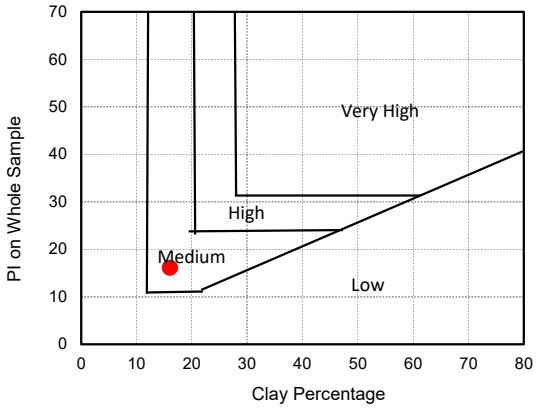
(SANS 3001 - GR10)

Liquid Limit	43
Plastic Limit	25
Plastic Index	18
Linear Shrinkage	9
Grading Modulus	0,42
Moisture Content	11,9
PI on Whole Sample	16
PRA Classification	A.7.6
Unified Classification	See Plasticity Chart
Coefficient of Curvature Cc	#DIV/0!
Coefficient of Uniformity Cu	#DIV/0!

ESTIMATED COMPOSITION (As BS 1377)

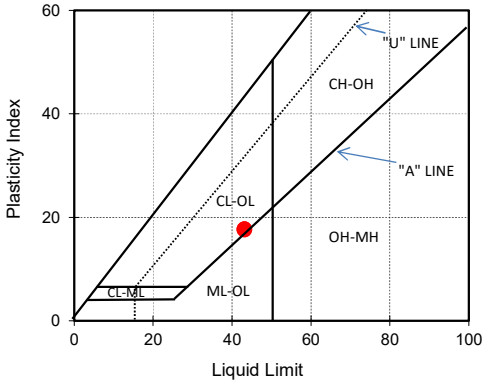
Clay (<0.002)	16,02
0.002 < Silt < 0.06	49,58
0.06 < Sand < 2.0	32,25
Gravel > 2.0	2,15
% less than 0.075	69,05

ACTIVITY CHART



PLASTICITY CHART

Fine Grained Soils: >50% passes 0.075



SOILS & MATERIALS TESTING
1164 Minnie Postma, Florida Ext 11
TEL: (011) 674 1325
e mail: lab@geopractica.co.za

FOUNDATION INDICATOR

Client	GEOID Geotechnical Engineers		
Location	Bultfontein TP 8 @ 0,45 - 2,0m		
Date	17-May-24	Test No	1753
Job No	24119	Checked By	EB

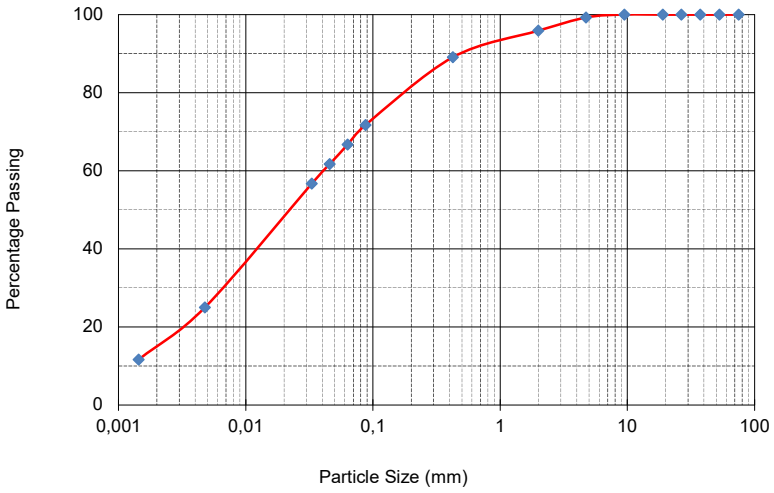
TEST DONE ACCORDING TO SANS & TMH METHODS

SIEVE ANALYSIS

Values are expressed as a percentage of total sample

Sieve Size (mm)	Total Passing (%)
75	100,00
53	100,00
37,5	100,00
26,5	100,00
19	100,00
9,5	100,00
4,75	99,26
2	95,86
0,425	89,08

GRADING ANALYSIS



HYDROMETER ANALYSIS

(TMH 1 Method A6)
Values are expressed as a percentage of total sample

Sieve Size (mm)	Total Passing (%)
0,0874	71,73
0,0633	66,73
0,0457	61,72
0,0330	56,72
0,0048	25,02
0,0014	11,68

ATTERBERG LIMITS & OTHER VALUES

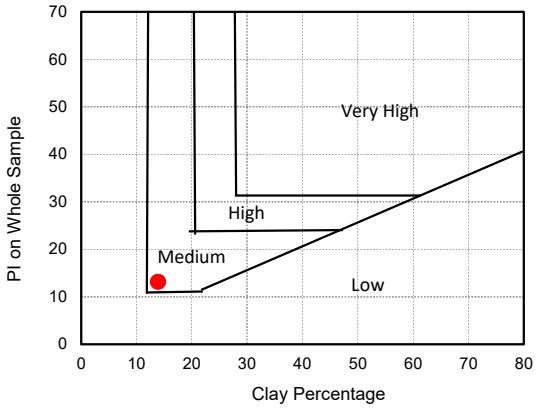
(SANS 3001 - GR10)

Liquid Limit	43
Plastic Limit	28
Plastic Index	15
Linear Shrinkage	8
Grading Modulus	0,46
Moisture Content	25,4
PI on Whole Sample	13
PRA Classification	A.7.6
Unified Classification	See Plasticity Chart
Coefficient of Curvature Cc	#DIV/0!
Coefficient of Uniformity Cu	#DIV/0!

ESTIMATED COMPOSITION (As BS 1377)

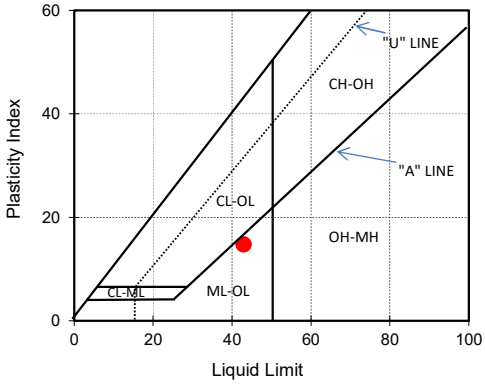
Clay (<0.002)	13,91
0.002 < Silt < 0.06	51,88
0.06 < Sand < 2.0	30,06
Gravel > 2.0	4,14
% less than 0.075	69,16

ACTIVITY CHART



PLASTICITY CHART

Fine Grained Soils: >50% passes 0.075



SOILS & MATERIALS TESTING
1164 Minnie Postma, Florida Ext 11
TEL: (011) 674 1325
e mail: lab@geopractica.co.za

FOUNDATION INDICATOR

Client	GEOID Geotechnical Engineers		
Location	Bultfontein TP 8 @ 2,8 - 3,0m		
Date	17-May-24	Test No	1770
Job No	24119	Checked By	EB

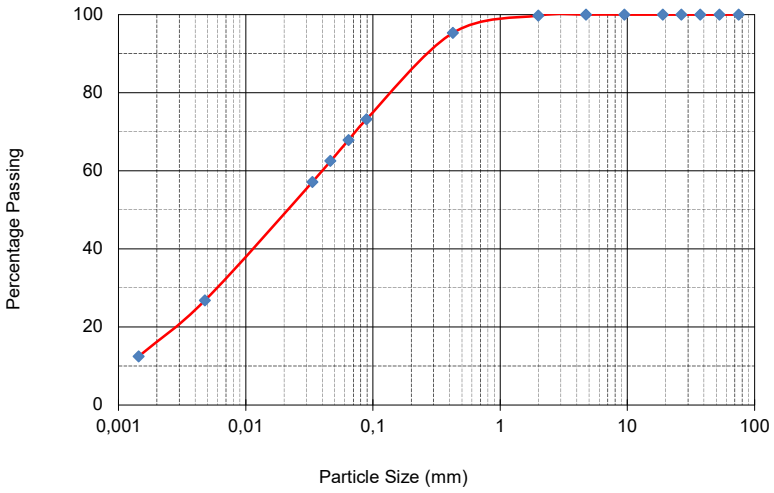
TEST DONE ACCORDING TO SANS & TMH METHODS

SIEVE ANALYSIS

Values are expressed as a percentage of total sample

Sieve Size (mm)	Total Passing (%)
75	100,00
53	100,00
37,5	100,00
26,5	100,00
19	100,00
9,5	100,00
4,75	100,00
2	99,76
0,425	95,32

GRADING ANALYSIS



HYDROMETER ANALYSIS

(TMH 1 Method A6)
Values are expressed as a percentage of total sample

Sieve Size (mm)	Total Passing (%)
0,0888	73,19
0,0642	67,83
0,0464	62,48
0,0335	57,12
0,0048	26,78
0,0014	12,50

ATTERBERG LIMITS & OTHER VALUES

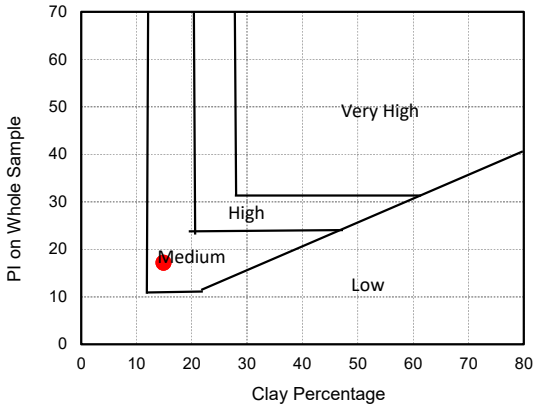
(SANS 3001 - GR10)

Liquid Limit	44
Plastic Limit	26
Plastic Index	18
Linear Shrinkage	9
Grading Modulus	0,35
Moisture Content	34,5
PI on Whole Sample	17
PRA Classification	A.7.6
Unified Classification	See Plasticity Chart
Coefficient of Curvature Cc	#DIV/0!
Coefficient of Uniformity Cu	#DIV/0!

ESTIMATED COMPOSITION (As BS 1377)

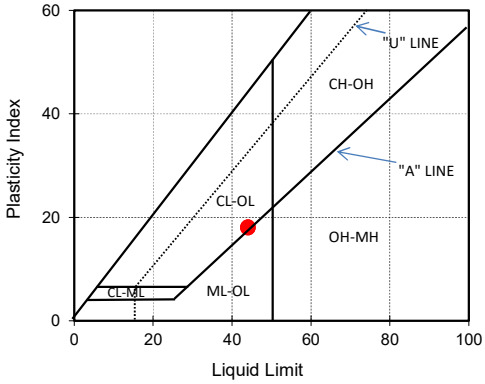
Clay (<0.002)	14,89
0.002 < Silt < 0.06	51,68
0.06 < Sand < 2.0	33,18
Gravel > 2.0	0,24
% less than 0.075	70,19

ACTIVITY CHART



PLASTICITY CHART

Fine Grained Soils: >50% passes 0.075



SOILS & MATERIALS TESTING
1164 Minnie Postma, Florida Ext 11
TEL: (011) 674 1325
e mail: lab@geopractica.co.za

FOUNDATION INDICATOR

Client	GEOID Geotechnical Engineers		
Location	Bultfontein TP 13 @ 1,1 - 1,5m		
Date	17-May-24	Test No	1771
Job No	24119	Checked By	EB

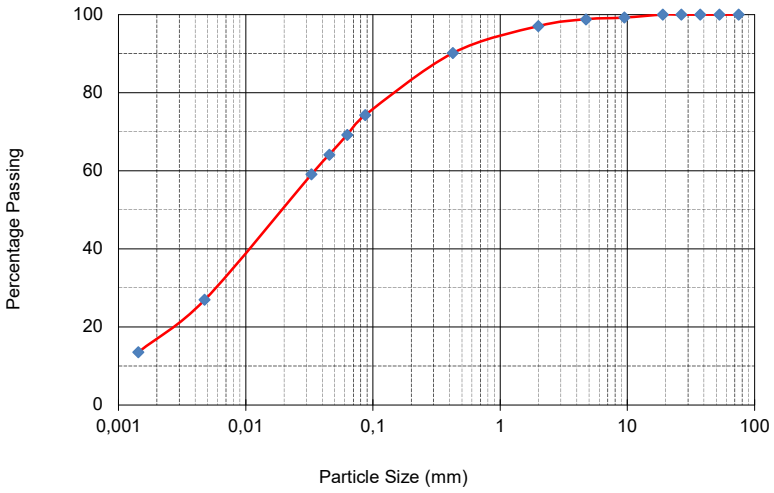
TEST DONE ACCORDING TO SANS & TMH METHODS

SIEVE ANALYSIS

Values are expressed as a percentage of total sample

Sieve Size (mm)	Total Passing (%)
75	100,00
53	100,00
37,5	100,00
26,5	100,00
19	100,00
9,5	99,21
4,75	98,80
2	97,05
0,425	90,14

GRADING ANALYSIS



HYDROMETER ANALYSIS

(TMH 1 Method A6)
Values are expressed as a percentage of total sample

Sieve Size (mm)	Total Passing (%)
0,0867	74,27
0,0628	69,21
0,0454	64,15
0,0328	59,08
0,0048	27,01
0,0014	13,50

ATTERBERG LIMITS & OTHER VALUES

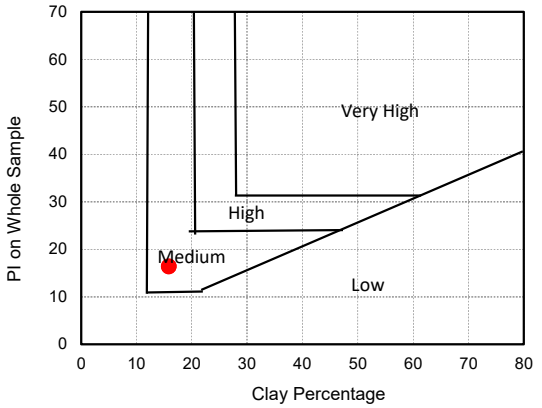
(SANS 3001 - GR10)

Liquid Limit	37
Plastic Limit	19
Plastic Index	18
Linear Shrinkage	9
Grading Modulus	0,41
Moisture Content	16,1
PI on Whole Sample	16
PRA Classification	A.6
Unified Classification	See Plasticity Chart
Coefficient of Curvature Cc	#DIV/0!
Coefficient of Uniformity Cu	#DIV/0!

ESTIMATED COMPOSITION (As BS 1377)

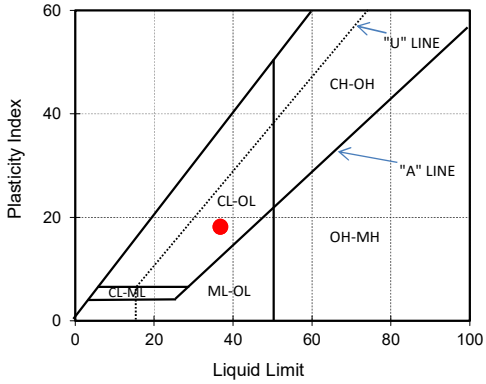
Clay (<0.002)	15,82
0.002 < Silt < 0.06	52,59
0.06 < Sand < 2.0	28,65
Gravel > 2.0	2,95
% less than 0.075	71,79

ACTIVITY CHART



PLASTICITY CHART

Fine Grained Soils: >50% passes 0.075



SOILS & MATERIALS TESTING
1164 Minnie Postma, Florida Ext 11
TEL: (011) 674 1325
e mail: lab@geopractica.co.za

FOUNDATION INDICATOR

Client	GEOID Geotechnical Engineers		
Location	Bultfontein TP 13 @ 1,1 - 1,5m		
Date	17-May-24	Test No	1755
Job No	24119	Checked By	EB

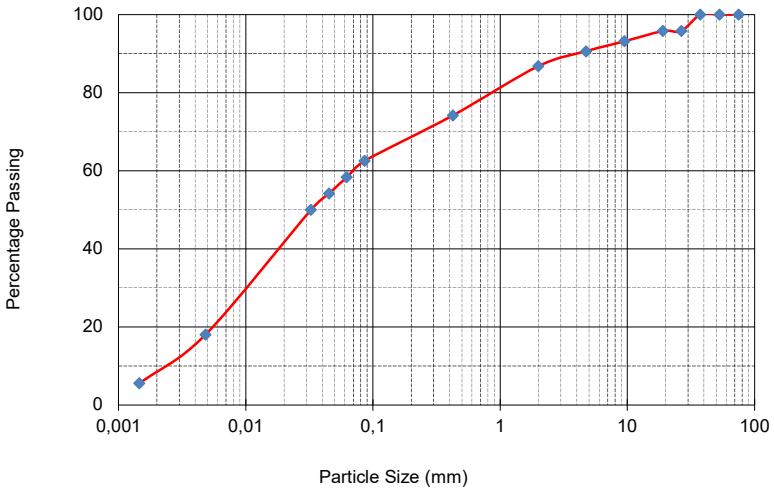
TEST DONE ACCORDING TO SANS & TMH METHODS

SIEVE ANALYSIS

Values are expressed as a percentage of total sample

Sieve Size (mm)	Total Passing (%)
75	100,00
53	100,00
37,5	100,00
26,5	95,78
19	95,78
9,5	93,15
4,75	90,61
2	86,78
0,425	74,21

GRADING ANALYSIS



HYDROMETER ANALYSIS

(TMH 1 Method A6)
Values are expressed as a percentage of total sample

Sieve Size (mm)	Total Passing (%)
0,0861	62,54
0,0623	58,37
0,0451	54,20
0,0326	50,03
0,0048	18,07
0,0015	5,56

ATTERBERG LIMITS & OTHER VALUES

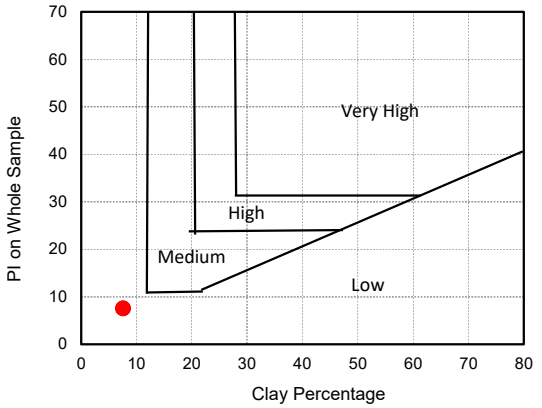
(SANS 3001 - GR10)

Liquid Limit	34
Plastic Limit	24
Plastic Index	10
Linear Shrinkage	5
Grading Modulus	0,78
Moisture Content	10,7
PI on Whole Sample	8
PRA Classification	A.6
Unified Classification	See Plasticity Chart
Coefficient of Curvature Cc	0,65
Coefficient of Uniformity Cu	31,82

ESTIMATED COMPOSITION (As BS 1377)

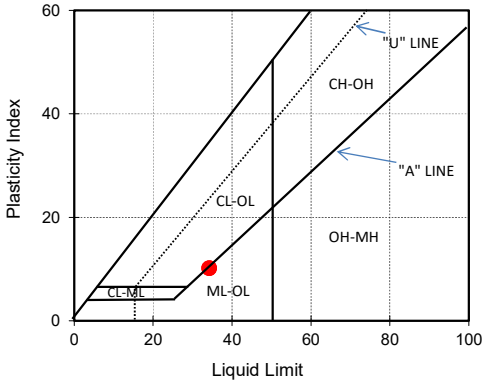
Clay (<0.002)	7,56
0.002 < Silt < 0.06	50,25
0.06 < Sand < 2.0	28,97
Gravel > 2.0	13,22
% less than 0.075	60,60

ACTIVITY CHART



PLASTICITY CHART

Fine Grained Soils: >50% passes 0.075



SOILS & MATERIALS TESTING
1164 Minnie Postma, Florida Ext 11
TEL: (011) 674 1325
e mail: lab@geopractica.co.za

FOUNDATION INDICATOR

Client	Geoid Geotechnical Engineers		
Location	Bultfontein TP 19 @ 0,4 - 1,5m		
Date	17-May-24	Test No	1757
Job No	24119	Checked By	EB

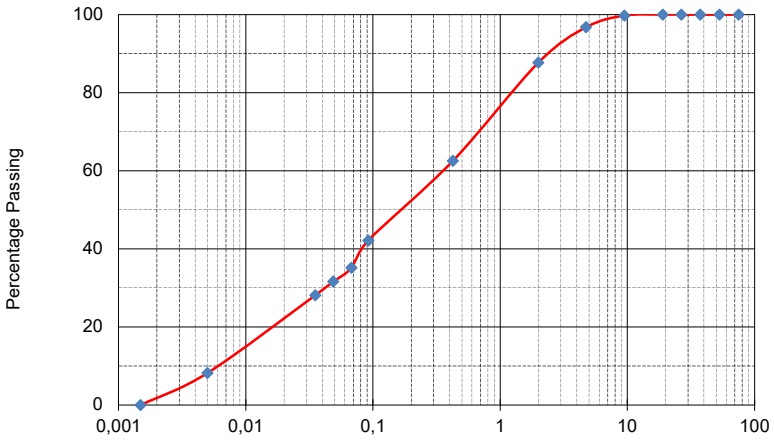
TEST DONE ACCORDING TO SANS & TMH METHODS

SIEVE ANALYSIS

Values are expressed as a percentage of total sample

Sieve Size (mm)	Total Passing (%)
75	100,00
53	100,00
37,5	100,00
26,5	100,00
19	100,00
9,5	99,77
4,75	96,77
2	87,71
0,425	62,57

GRADING ANALYSIS



HYDROMETER ANALYSIS

(TMH 1 Method A6)
Values are expressed as a percentage of total sample

Sieve Size (mm)	Total Passing (%)
0,0921	42,18
0,0678	35,15
0,0489	31,64
0,0352	28,12
0,0050	8,20
0,0015	0,00

ATTERBERG LIMITS & OTHER VALUES

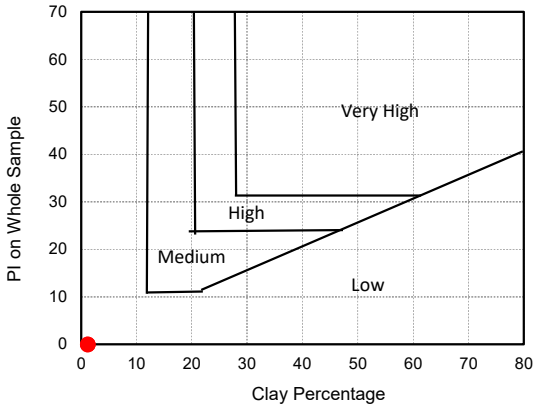
(SANS 3001 - GR10)

Liquid Limit	Non Plastic
Plastic Limit	Non Plastic
Plastic Index	Non Plastic
Linear Shrinkage	0
Grading Modulus	1,12
Moisture Content	12,7
PI on Whole Sample	Non Plastic
PRA Classification	A.4
Unified Classification	SM
Coefficient of Curvature Cc	0,80
Coefficient of Uniformity Cu	58,33

ESTIMATED COMPOSITION (As BS 1377)

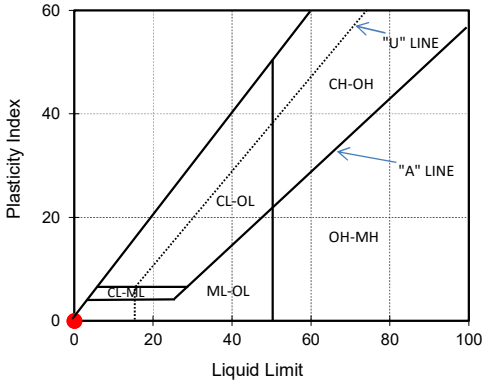
Clay (<0.002)	1,20
0.002 < Silt < 0.06	32,51
0.06 < Sand < 2.0	54,01
Gravel > 2.0	12,29
% less than 0.075	37,24

ACTIVITY CHART



PLASTICITY CHART

Fine Grained Soils: >50% passes 0.075



SOILS & MATERIALS TESTING
1164 Minnie Postma, Florida Ext 11
TEL: (011) 674 1325
e mail: lab@geopractica.co.za

FOUNDATION INDICATOR

Client	GEOID Geotechnical Engineers		
Location	Bultfontein TP 19 @ 1,4 - 2,3m		
Date	17-May-24	Test No	1759
Job No	24119	Checked By	EB

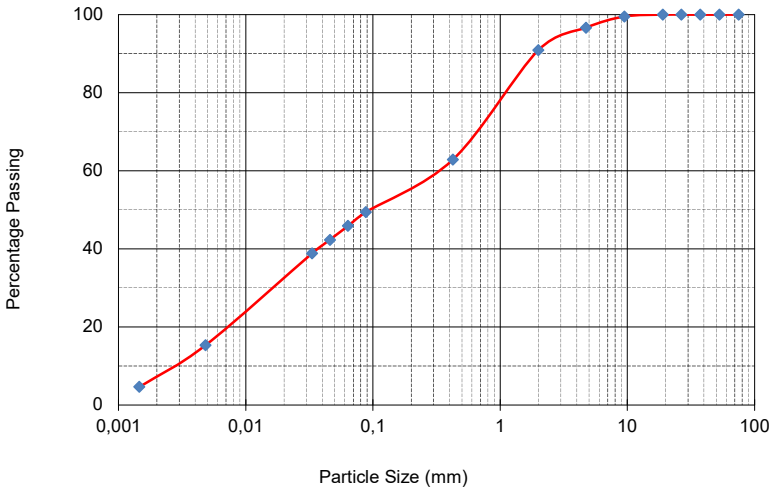
TEST DONE ACCORDING TO SANS & TMH METHODS

SIEVE ANALYSIS

Values are expressed as a percentage of total sample

Sieve Size (mm)	Total Passing (%)
75	100,00
53	100,00
37,5	100,00
26,5	100,00
19	100,00
9,5	99,53
4,75	96,67
2	90,88
0,425	62,83

GRADING ANALYSIS



HYDROMETER ANALYSIS

(TMH 1 Method A6)
Values are expressed as a percentage of total sample

Sieve Size (mm)	Total Passing (%)
0,0881	49,42
0,0637	45,89
0,0460	42,36
0,0332	38,83
0,0048	15,30
0,0015	4,71

ATTERBERG LIMITS & OTHER VALUES

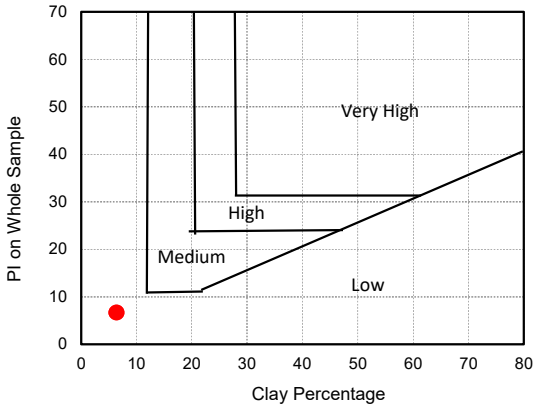
(SANS 3001 - GR10)

Liquid Limit	35
Plastic Limit	24
Plastic Index	11
Linear Shrinkage	5
Grading Modulus	0,99
Moisture Content	14,9
PI on Whole Sample	7
PRA Classification	A.6
Unified Classification	SC
Coefficient of Curvature Cc	0,34
Coefficient of Uniformity Cu	107,14

ESTIMATED COMPOSITION (As BS 1377)

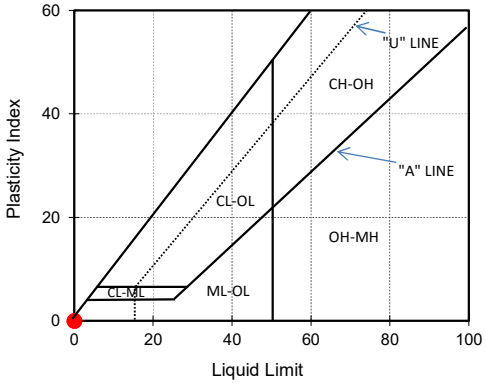
Clay (<0.002)	6,40
0.002 < Silt < 0.06	38,74
0.06 < Sand < 2.0	45,73
Gravel > 2.0	9,12
% less than 0.075	47,52

ACTIVITY CHART



PLASTICITY CHART

Fine Grained Soils: >50% passes 0.075



SOILS & MATERIALS TESTING
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FOUNDATION INDICATOR

Client	Geoid Geotechnical Engineers		
Location	Bultfontein TP 20 @ 0,1 - 0,3m		
Date	17-May-24	Test No	1761
Job No	24119	Checked By	EB

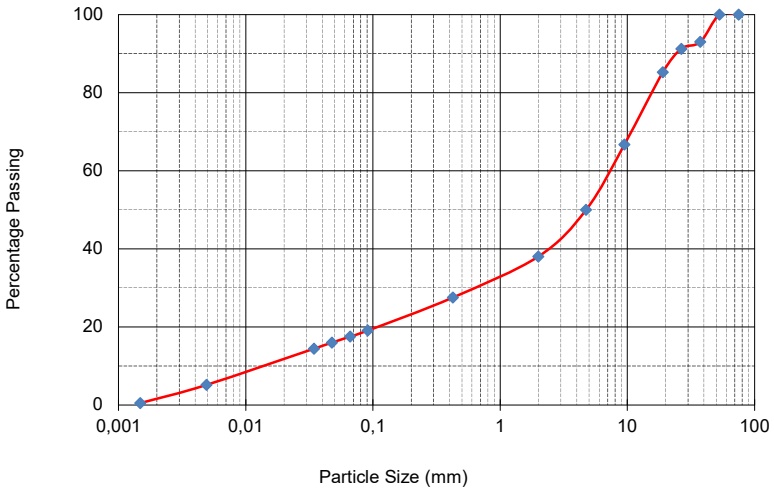
TEST DONE ACCORDING TO SANS & TMH METHODS

SIEVE ANALYSIS

Values are expressed as a percentage of total sample

Sieve Size (mm)	Total Passing (%)
75	100,00
53	100,00
37,5	93,02
26,5	91,26
19	85,21
9,5	66,73
4,75	50,04
2	38,06
0,425	27,55

GRADING ANALYSIS



HYDROMETER ANALYSIS

(TMH 1 Method A6)
Values are expressed as a percentage of total sample

Sieve Size (mm)	Total Passing (%)
0,0914	19,09
0,0660	17,54
0,0476	15,99
0,0343	14,45
0,0049	5,16
0,0015	0,52

ATTERBERG LIMITS & OTHER VALUES

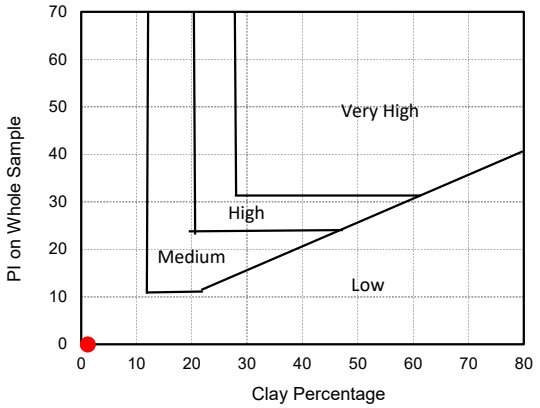
(SANS 3001 - GR10)

Liquid Limit	Non Plastic
Plastic Limit	Non Plastic
Plastic Index	Non Plastic
Linear Shrinkage	0
Grading Modulus	2,16
Moisture Content	2,6
PI on Whole Sample	Non Plastic
PRA Classification	A.1.b
Unified Classification	SM
Coefficient of Curvature Cc	3,57
Coefficient of Uniformity Cu	514,29

ESTIMATED COMPOSITION (As BS 1377)

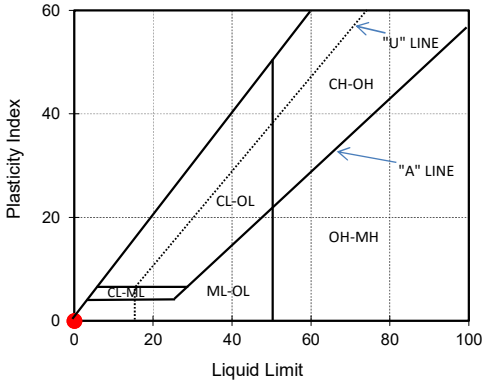
Clay (<0.002)	1,22
0.002 < Silt < 0.06	15,82
0.06 < Sand < 2.0	21,02
Gravel > 2.0	61,94
% less than 0.075	18,09

ACTIVITY CHART



PLASTICITY CHART

Fine Grained Soils: >50% passes 0.075



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FOUNDATION INDICATOR

Client	GEOID GEOTECHNICAL ENGINEERS		
Location	HIRE ALL - LANSERIA TP 114 / D114 / 1 @ 0,5 - 1,0m		
Date	09 MARCH 2018	Test No	870
Job No	18083	Checked By	MM

SIEVE ANALYSIS

Values are expressed as a percentage of total sample

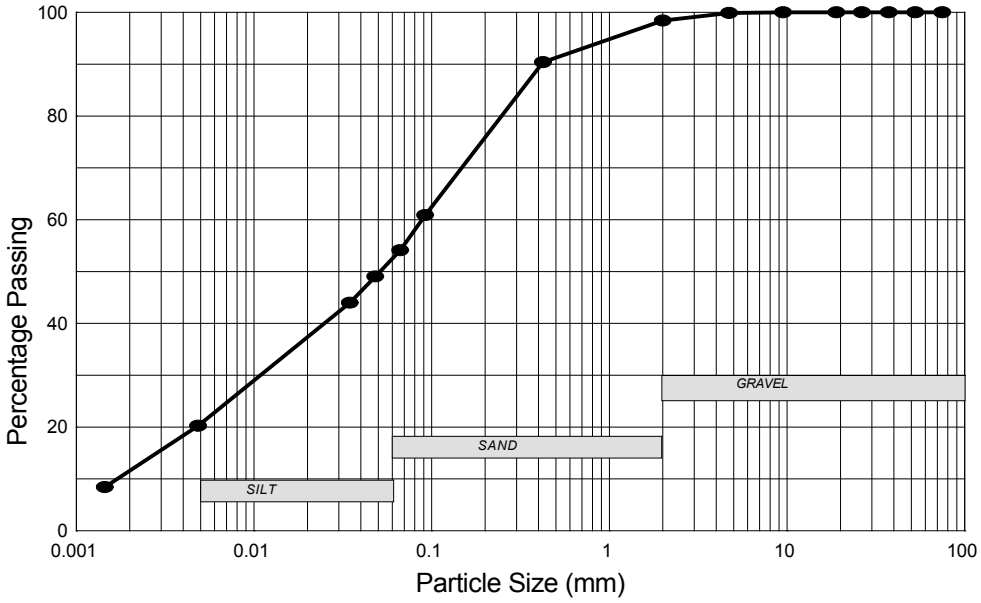
Sieve Size (mm)	Total Passing (%)
75.00	100.00
53.00	100.00
37.50	100.00
26.50	100.00
19.00	100.00
9.50	100.00
4.75	99.90
2.00	98.46
0.425	90.40

HYDROMETER ANALYSIS

Values are expressed as a percentage of total sample

Sieve Size (mm)	Total Passing (%)
0.0921	60.94
0.0669	54.17
0.0482	49.09
0.0348	44.01
0.0049	20.31
0.0015	8.46

GRADING ANALYSIS



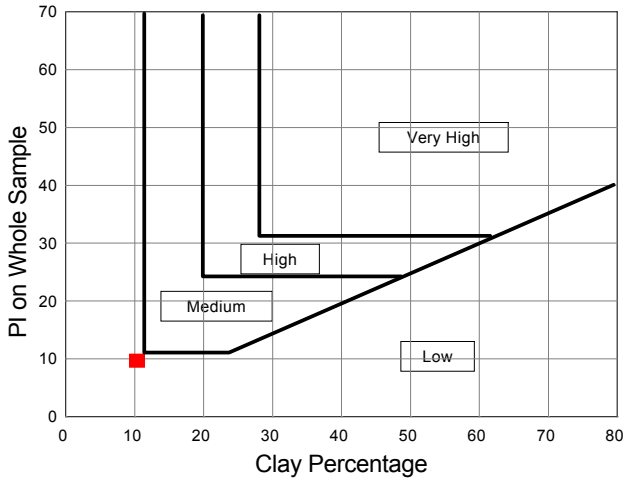
ATTERBERG LIMITS & OTHER VALUES

Liquid Limit	41
Plastic Limit	31
Plastic Index	11
Linear Shrinkage	5
Grading Modulus	0.50
Moisture Content	23.32
PI on Whole Sample	10
PRA Classification	A.7.5
Unified Classification	See Plasticity Chart

ESTIMATED COMPOSITION (As BS 1377)

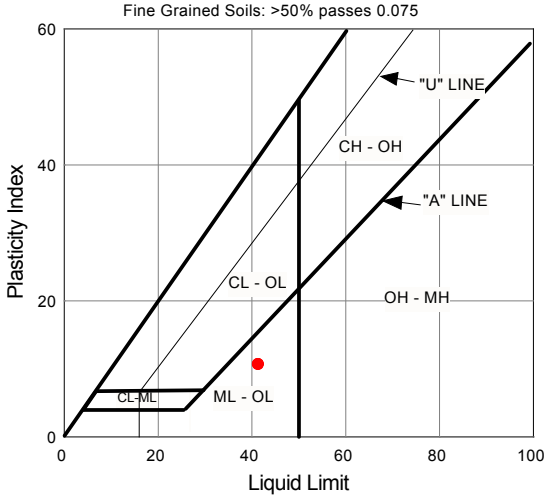
Clay (<0.002)	10.38
0.002 < Silt < 0.06	41.92
0.06 < Sand < 2.0	46.17
Gravel > 2.0	1.54
% less than 0.075	56.35

ACTIVITY CHART



PLASTICITY CHART

Fine Grained Soils: >50% passes 0.075



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FOUNDATION INDICATOR

Client	GEOID GEOTECHNICAL ENGINEERS		
Location	HIRE ALL - LANSERIA TP 109 / B109 / 1 @ 0,05 - 0,25m		
Date	09 MARCH 2018	Test No	871
Job No	18083	Checked By	MM

SIEVE ANALYSIS

Values are expressed as a percentage of total sample

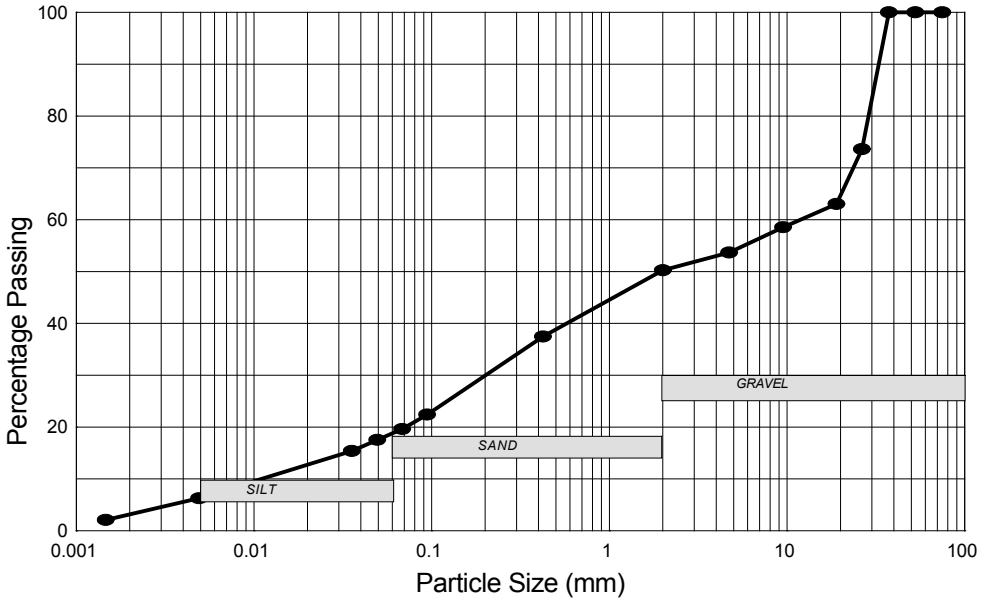
Sieve Size (mm)	Total Passing (%)
75.00	100.00
53.00	100.00
37.50	100.00
26.50	73.65
19.00	63.08
9.50	58.56
4.75	53.68
2.00	50.26
0.425	37.47

HYDROMETER ANALYSIS

Values are expressed as a percentage of total sample

Sieve Size (mm)	Total Passing (%)
0.0946	22.46
0.0687	19.65
0.0495	17.54
0.0356	15.44
0.0049	6.32
0.0015	2.11

GRADING ANALYSIS



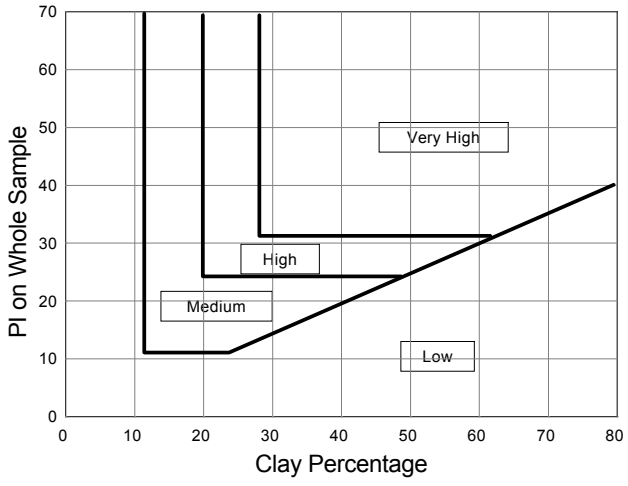
ATTERBERG LIMITS & OTHER VALUES

Liquid Limit	Non Plastic
Plastic Limit	Non Plastic
Plastic Index	Non Plastic
Linear Shrinkage	0
Grading Modulus	1.90
Moisture Content	1.60
PI on Whole Sample	Non Plastic
PRA Classification	A.1.b
Unified Classification	SM

ESTIMATED COMPOSITION (As BS 1377)

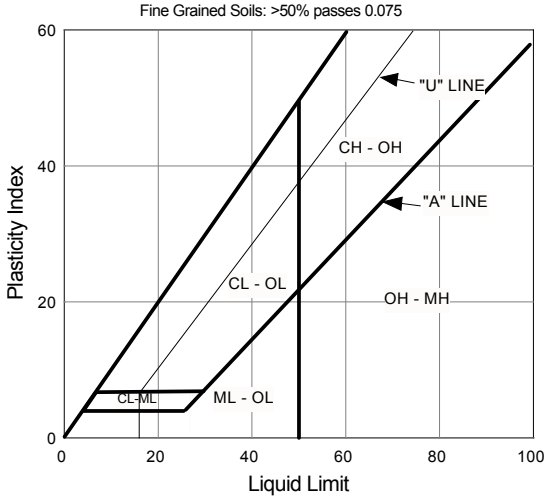
Clay (<0.002)	2.75
0.002 < Silt < 0.06	15.95
0.06 < Sand < 2.0	31.56
Gravel > 2.0	49.74
% less than 0.075	20.33

ACTIVITY CHART



PLASTICITY CHART

Fine Grained Soils: >50% passes 0.075



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FOUNDATION INDICATOR

Client	GEOID GEOTECHNICAL ENGINEERS		
Location	HIRE ALL - LANSERIA TP 109 / B109 / 1 @ 0,25 - 2,05m		
Date	09 MARCH 2018	Test No	873
Job No	18083	Checked By	MM

SIEVE ANALYSIS

Values are expressed as a percentage of total sample

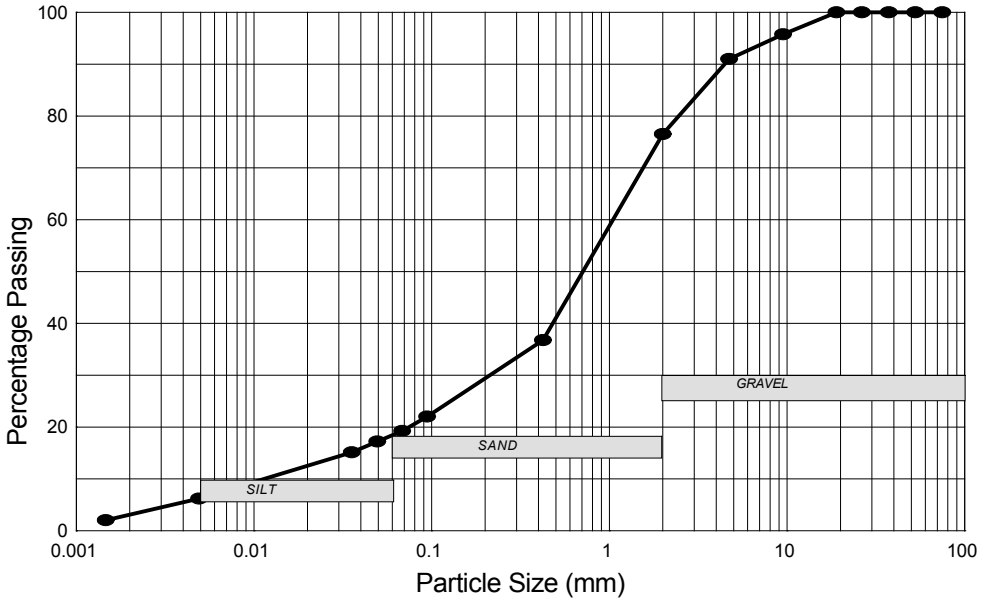
Sieve Size (mm)	Total Passing (%)
75.00	100.00
53.00	100.00
37.50	100.00
26.50	100.00
19.00	100.00
9.50	95.77
4.75	91.05
2.00	76.53
0.425	36.81

HYDROMETER ANALYSIS

Values are expressed as a percentage of total sample

Sieve Size (mm)	Total Passing (%)
0.0946	22.06
0.0687	19.30
0.0495	17.23
0.0356	15.17
0.0049	6.20
0.0015	2.07

GRADING ANALYSIS



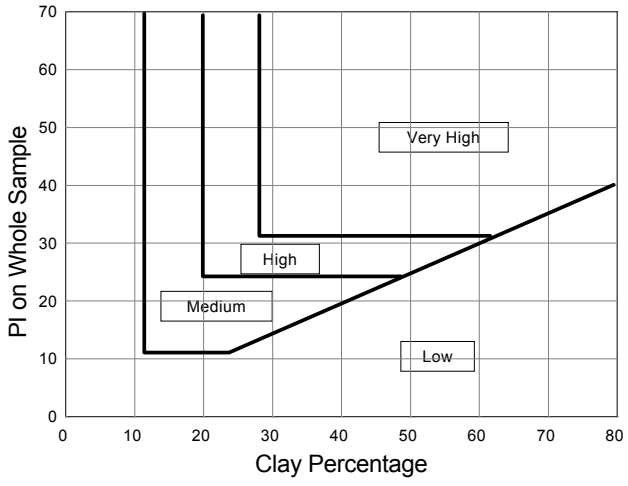
ATTERBERG LIMITS & OTHER VALUES

Liquid Limit	Non Plastic
Plastic Limit	Non Plastic
Plastic Index	Non Plastic
Linear Shrinkage	0
Grading Modulus	1.65
Moisture Content	5.41
PI on Whole Sample	Non Plastic
PRA Classification	A.1.b
Unified Classification	SM

ESTIMATED COMPOSITION (As BS 1377)

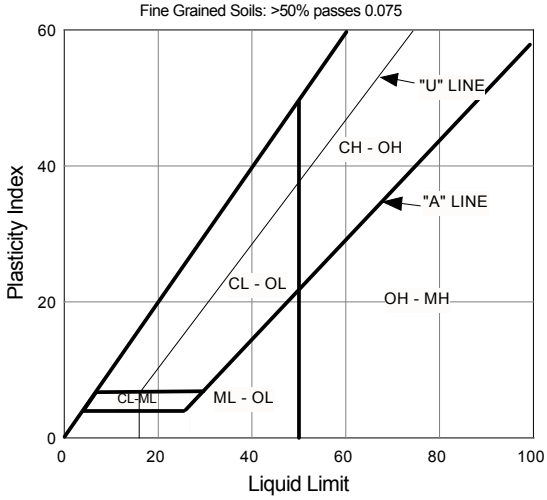
Clay (<0.002)	2.70
0.002 < Silt < 0.06	15.67
0.06 < Sand < 2.0	58.16
Gravel > 2.0	23.47
% less than 0.075	19.98

ACTIVITY CHART



PLASTICITY CHART

Fine Grained Soils: >50% passes 0.075



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FOUNDATION INDICATOR

Client	GEOID GEOTECHNICAL ENGINEERS		
Location	HIRE ALL - LANSERIA TP 111 / U111 / 1 @ 0,5 - 0,7m		
Date	09 MARCH 2018	Test No	875
Job No	18083	Checked By	MM

SIEVE ANALYSIS

Values are expressed as a percentage of total sample

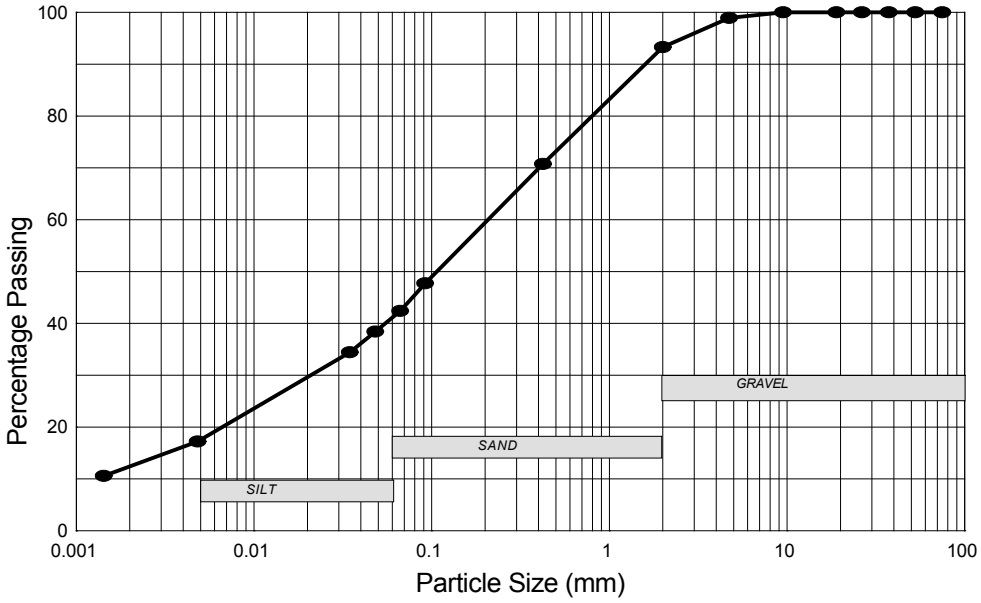
Sieve Size (mm)	Total Passing (%)
75.00	100.00
53.00	100.00
37.50	100.00
26.50	100.00
19.00	100.00
9.50	100.00
4.75	98.94
2.00	93.32
0.425	70.80

HYDROMETER ANALYSIS

Values are expressed as a percentage of total sample

Sieve Size (mm)	Total Passing (%)
0.0921	47.73
0.0669	42.43
0.0482	38.45
0.0348	34.47
0.0048	17.24
0.0014	10.61

GRADING ANALYSIS



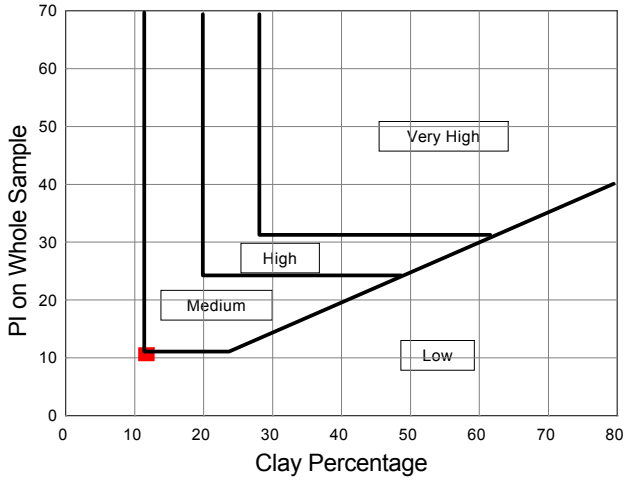
ATTERBERG LIMITS & OTHER VALUES

Liquid Limit	38
Plastic Limit	23
Plastic Index	15
Linear Shrinkage	8
Grading Modulus	0.88
Moisture Content	9.84
PI on Whole Sample	11
PRA Classification	A.6
Unified Classification	SC

ESTIMATED COMPOSITION (As BS 1377)

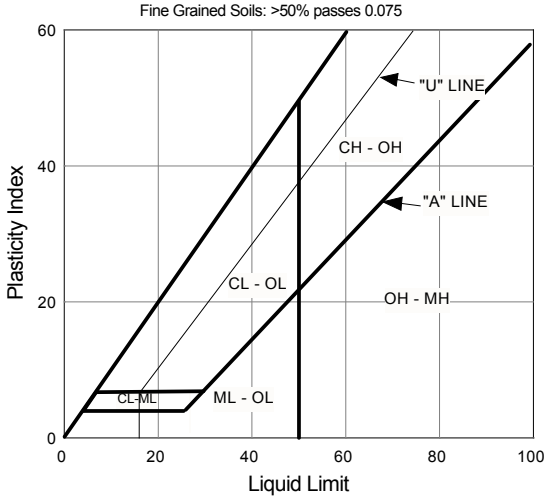
Clay (<0.002)	11.72
0.002 < Silt < 0.06	29.24
0.06 < Sand < 2.0	52.36
Gravel > 2.0	6.68
% less than 0.075	44.13

ACTIVITY CHART



PLASTICITY CHART

Fine Grained Soils: >50% passes 0.075



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FOUNDATION INDICATOR

Client	GEOID GEOTECHNICAL ENGINEERS		
Location	HIRE ALL - LANSERIA TP 111 / U111 / 2 @ 1,4 - 1,6m		
Date	09 MARCH 2018	Test No	877
Job No	18083	Checked By	MM

SIEVE ANALYSIS

Values are expressed as a percentage of total sample

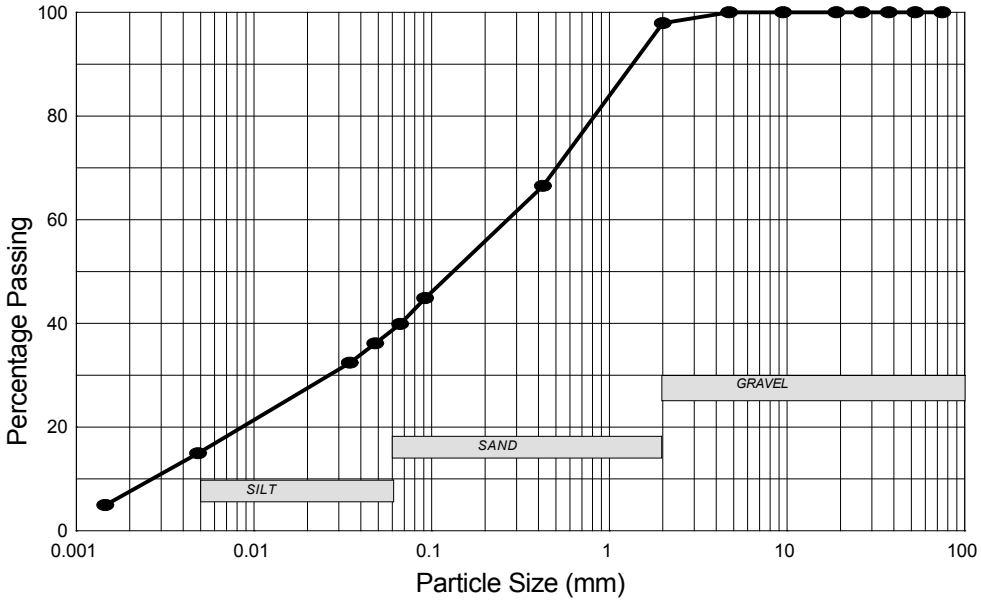
Sieve Size (mm)	Total Passing (%)
75.00	100.00
53.00	100.00
37.50	100.00
26.50	100.00
19.00	100.00
9.50	100.00
4.75	100.00
2.00	97.94
0.425	66.57

HYDROMETER ANALYSIS

Values are expressed as a percentage of total sample

Sieve Size (mm)	Total Passing (%)
0.0921	44.88
0.0669	39.89
0.0482	36.15
0.0348	32.41
0.0049	14.96
0.0015	4.99

GRADING ANALYSIS



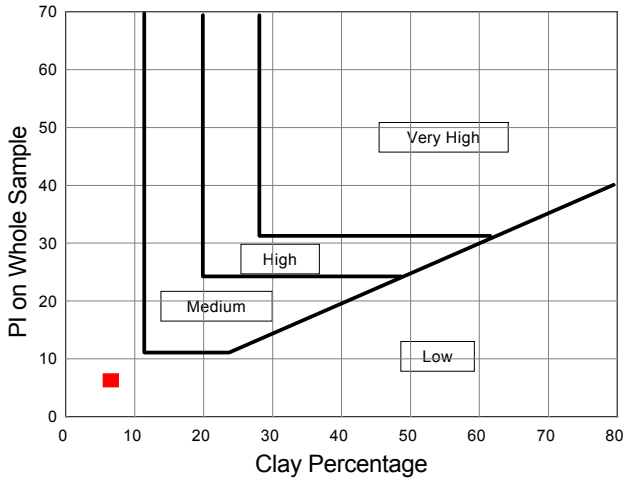
ATTERBERG LIMITS & OTHER VALUES

Liquid Limit	39
Plastic Limit	30
Plastic Index	9
Linear Shrinkage	5
Grading Modulus	0.91
Moisture Content	13.64
PI on Whole Sample	6
PRA Classification	A.4
Unified Classification	SC

ESTIMATED COMPOSITION (As BS 1377)

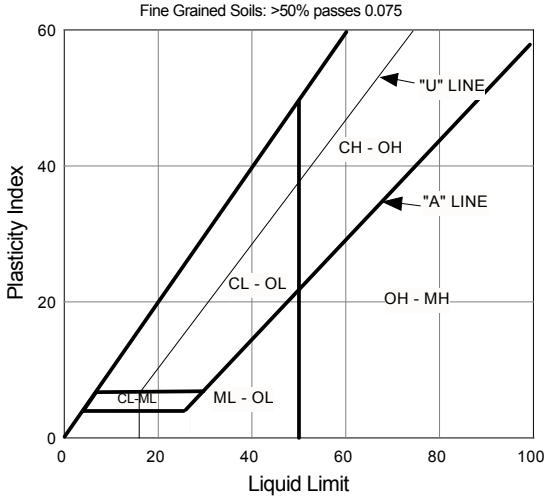
Clay (<0.002)	6.57
0.002 < Silt < 0.06	31.94
0.06 < Sand < 2.0	59.43
Gravel > 2.0	2.06
% less than 0.075	41.50

ACTIVITY CHART



PLASTICITY CHART

Fine Grained Soils: >50% passes 0.075



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C.B.R. DETERMINATION

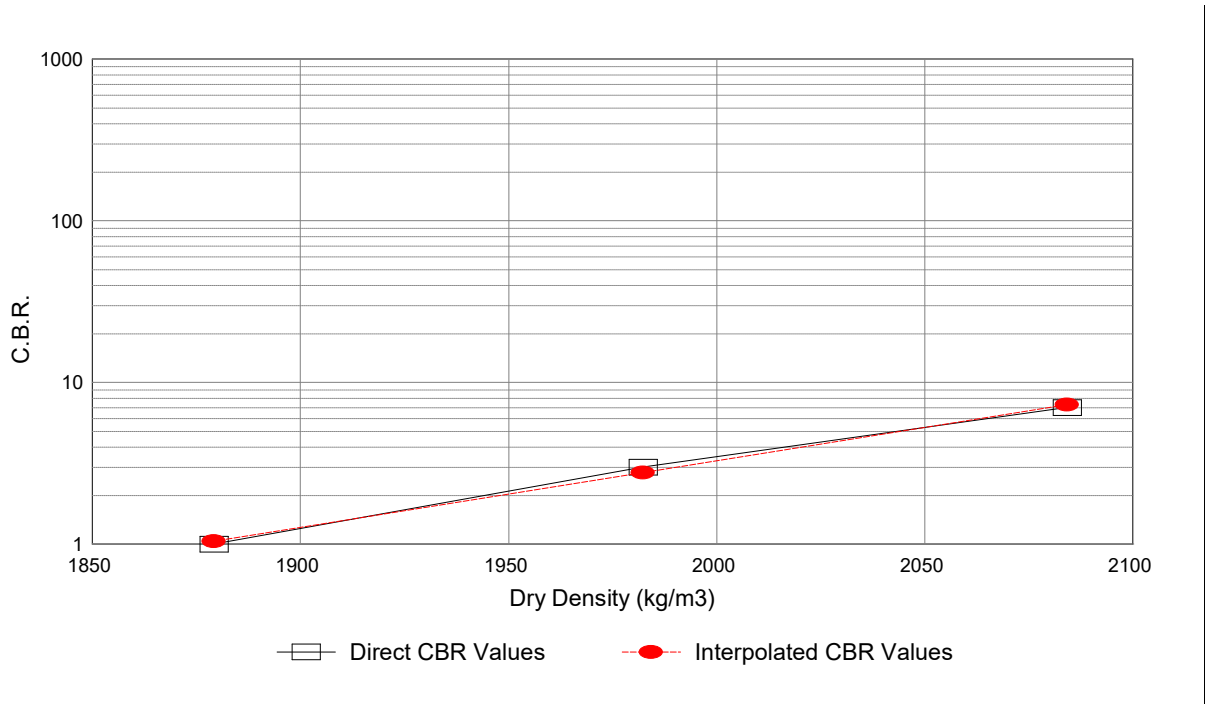
Client	Geoid Geotechnical Engineers		
Location	Bultfontein TP 8 @ 0,45 - 2,0m		
Date	17 May 2024	Test No	1754
Job No	24119	Checked By	EB
Calibration Date	14 December 2022	Calibration Certificate	6784

Direct Results from Test Procedure

Maximum Dry Density (kg/m3)	2083		Optimum Moisture Content (%)	6,9	
Percentage Mod AASHTO	100,0	95,1	90,2		
CBR @ 2.54mm	7	3	1		
CBR @ 5.08mm	8	4	1		
CBR@ 7.62mm	9	5	1		
Average Moisture Content (%)		7,1			
Percentage Swell	0,71	0,83	0,87		

Interpolated Results

Percentage Mod AASHTO	90	93	95	98	100
CBR	1	2	3	5	7



Programed Data
Revision No 5 (1/11/2017)

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C.B.R. DETERMINATION

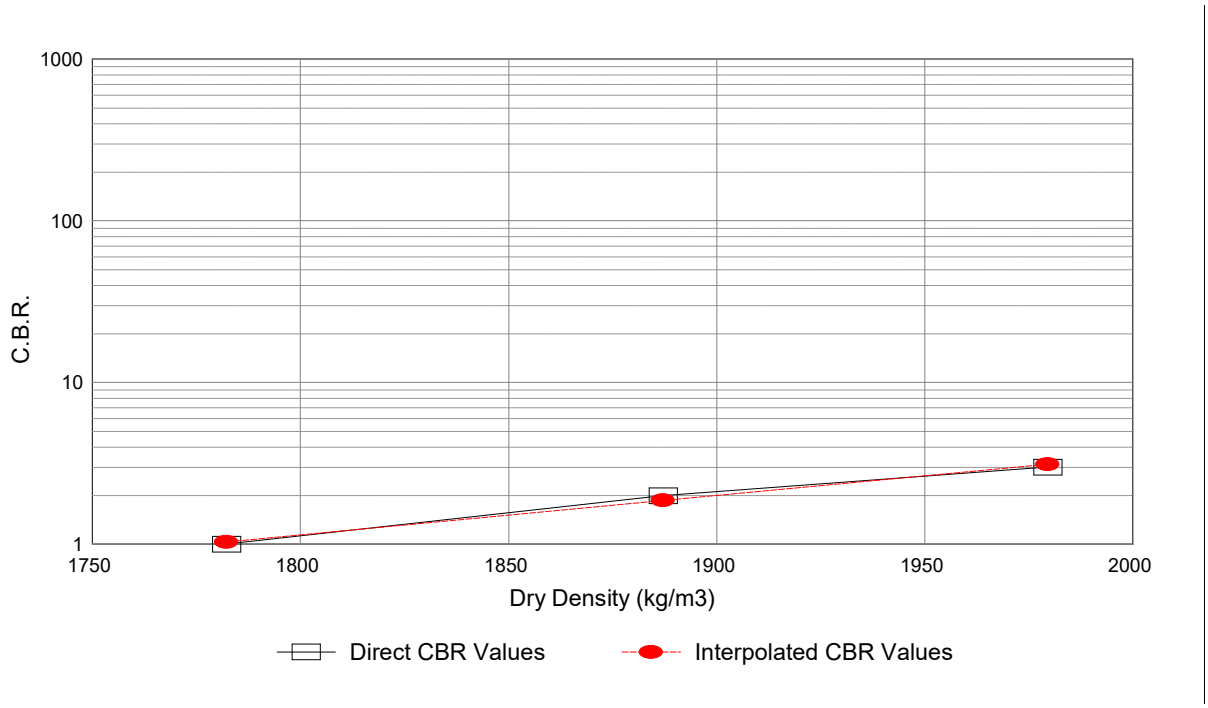
Client	Geoid Geotechnical Engineers		
Location	Bultfontein TP 13 @ 1,1 - 1,5m		
Date	17 May 2024	Test No	1756
Job No	24119	Checked By	EB
Calibration Date	14 December 2022	Calibration Certificate	6784

Direct Results from Test Procedure

Maximum Dry Density (kg/m3)	1982		Optimum Moisture Content (%)	9,7	
Percentage Mod AASHTO	99,9	95,2	89,9		
CBR @ 2.54mm	3	2	1		
CBR @ 5.08mm	3	2	1		
CBR@ 7.62mm	3	2	1		
Average Moisture Content (%)		9,4			
Percentage Swell	0,99	1,11	1,22		

Interpolated Results

Percentage Mod AASHTO	90	93	95	98	100
CBR	1	1	2	3	3



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C.B.R. DETERMINATION

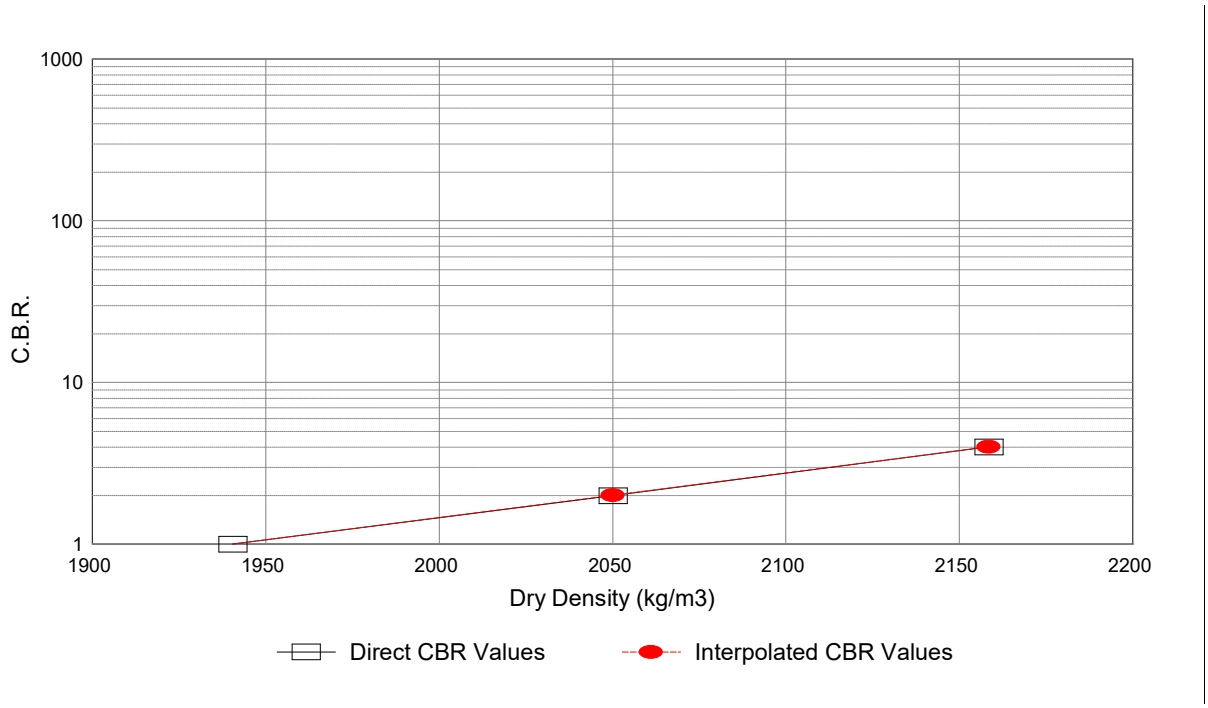
Client	Geoid Geotechnical Engineers		
Location	Bultfontein TP 19 @ 0,4 - 1,5m		
Date	17 May 2024	Test No	1758
Job No	24119	Checked By	EB
Calibration Date	14 December 2022	Calibration Certificate	6784

Direct Results from Test Procedure

Maximum Dry Density (kg/m3)	2151		Optimum Moisture Content (%)	8,2	
Percentage Mod AASHTO	100,4	95,3	90,2		
CBR @ 2.54mm	4	2	1		
CBR @ 5.08mm	6	3	1		
CBR@ 7.62mm	6	3	1		
Average Moisture Content (%)		8,3			
Percentage Swell	0,43	0,59	0,79		

Interpolated Results

Percentage Mod AASHTO	90	93	95	98	100
CBR	1	1	2	3	4



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C.B.R. DETERMINATION

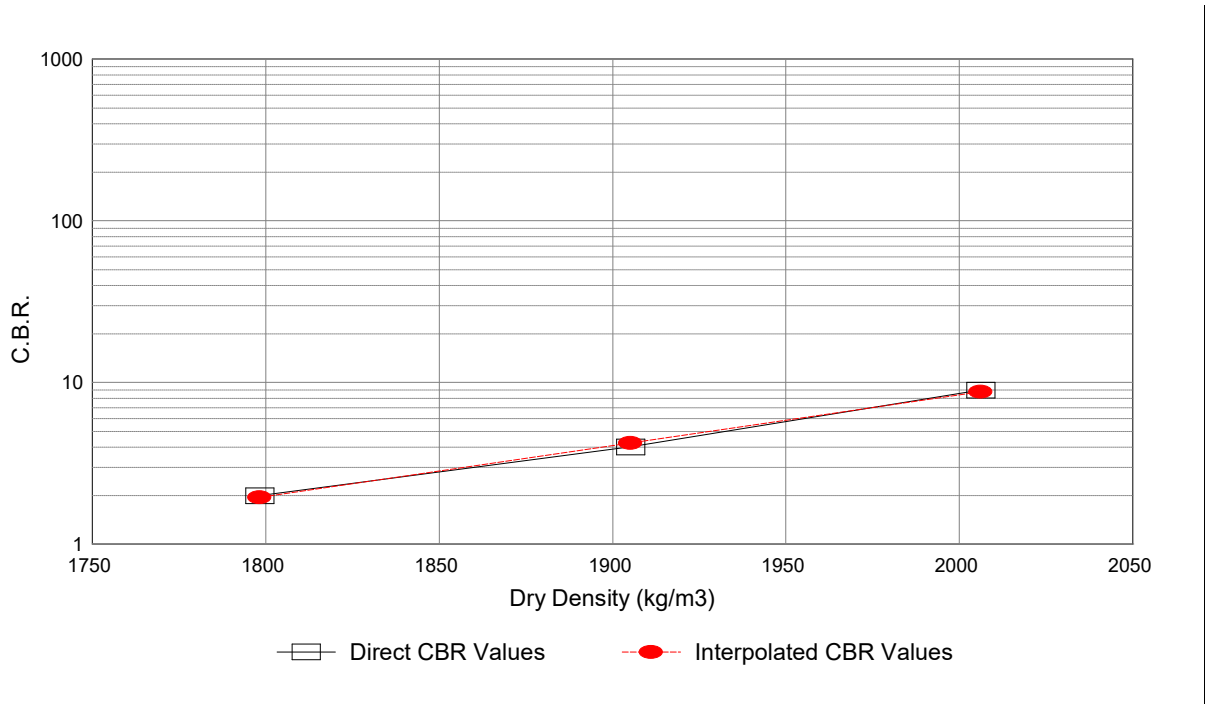
Client	Geoid Geotechnical Engineers		
Location	Bultfontein TP 19 @ 1,4 - 2,3m		
Date	17 May 2024	Test No	1760
Job No	24119	Checked By	EB
Calibration Date	14 December 2022	Calibration Certificate	6784

Direct Results from Test Procedure

Maximum Dry Density (kg/m3)	2000		Optimum Moisture Content (%)	11,6	
Percentage Mod AASHTO	100,3	95,3	89,9		
CBR @ 2.54mm	9	4	2		
CBR @ 5.08mm	9	5	2		
CBR@ 7.62mm	12	6	3		
Average Moisture Content (%)		11,7			
Percentage Swell	0,75	0,87	0,98		

Interpolated Results

Percentage Mod AASHTO	90	93	95	98	100
CBR	2	3	4	6	8



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C.B.R. DETERMINATION

Client	Geoid Geotechnical Engineers		
Location	Bultfontein TP 20 @ 0,1 - 0,3m		
Date	17 May 2024	Test No	1762
Job No	24119	Checked By	EB
Calibration Date	14 December 2022	Calibration Certificate	6784

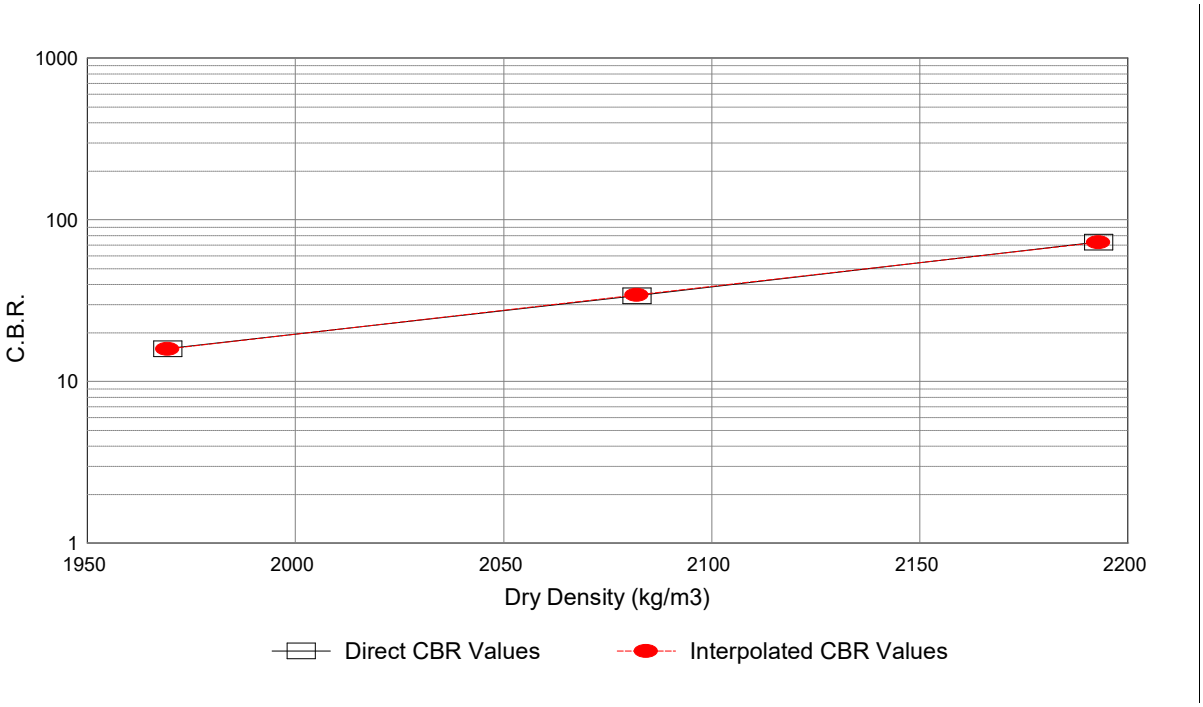
Direct Results from Test Procedure

Maximum Dry Density (kg/m3)	2193	Optimum Moisture Content (%)	6,2

Percentage Mod AASHTO	100,0	95,0	89,8
CBR @ 2.54mm	73	34	16
CBR @ 5.08mm	74	37	18
CBR@ 7.62mm	81	42	20
Average Moisture Content (%)		6,1	
Percentage Swell	0,00	0,00	0,00

Interpolated Results

Percentage Mod AASHTO	90	93	95	98	100
CBR	16	26	35	54	73



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C.B.R. DETERMINATION

Client	GEOID GEOTECHNICAL ENGINEERS		
Location	HIRE ALL - LANSERIA	B109 / 1 @ 0,05 - 0,25m	
Date	13 MARCH 2018	Test No	872
Job No	18083	Checked By	EB
Calibration Date	30 January 2017	Calibration Certificate	9475

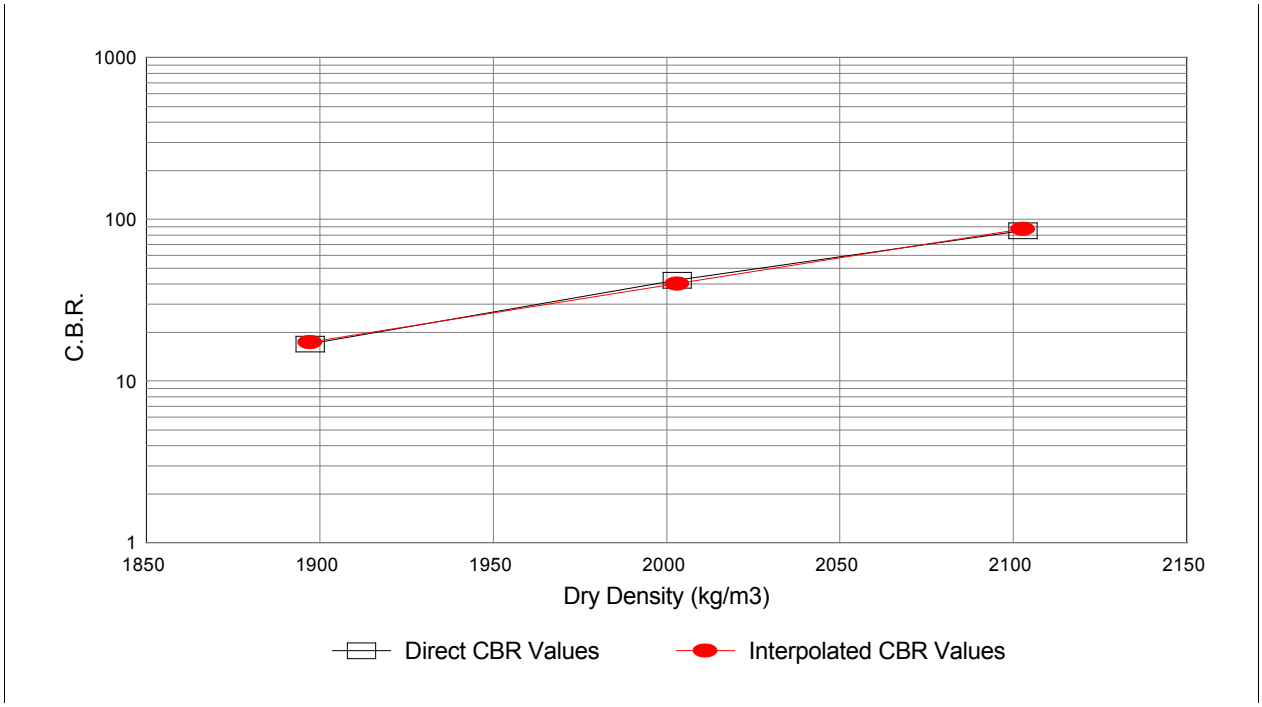
Direct Results from Test Procedure

Maximum Dry Density (kg/m3)	2105	Optimum Moisture Content (%)	6.5	

Percentage Mod AASHTO	99.9	95.1	90.1
CBR @ 2.54mm	85	42	17
CBR @ 5.08mm	91	44	19
CBR@ 7.62mm	101	44	22
Average Moisture Content (%)	6.6		
Percentage Swell	0.31	0.40	0.50

Interpolated Results

Percentage Mod AASHTO	90	93	95	98	100
CBR	17	28	39	64	89



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C.B.R. DETERMINATION

Client	GEOID GEOTECHNICAL ENGINEERS		
Location	HIRE ALL - LANSERIA	B109 / 2 @ 0,25 - 2,05m	
Date	19 MARCH 2018	Test No	874
Job No	18083	Checked By	EB
Calibration Date	30 January 2017	Calibration Certificate	9475

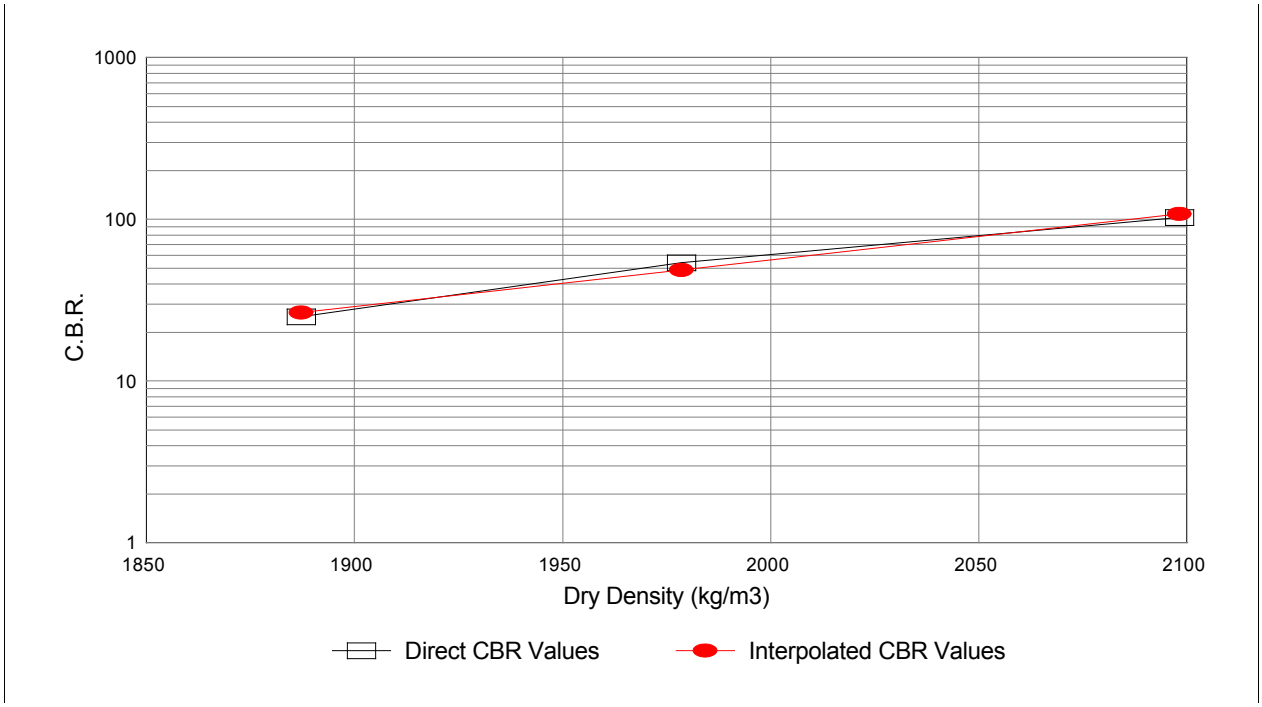
Direct Results from Test Procedure

Maximum Dry Density (kg/m3)	2093	Optimum Moisture Content (%)	8.2	

Percentage Mod AASHTO	100.2	94.5	90.2
CBR @ 2.54mm	103	54	25
CBR @ 5.08mm	106	54	28
CBR@ 7.62mm	115	61	32
Average Moisture Content (%)	8.2		
Percentage Swell	0.06	0.12	0.16

Interpolated Results

Percentage Mod AASHTO	90	93	95	98	100
CBR	26	39	52	79	104



Programed Data
Revision No 5 (1/11/2017)

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SINGLE OEDOMETER CONSOLIDATION - SOAKED AT 10 kPa

Client	GEOID Geotechnical Engineers		
Location	Bultfontein TP 8 @ 2,1 - 2,3m		
Date	17 May 2024	Test No	1764
Job No	24119	Checked By	EB

Sample Height (mm)	20	Sample Diameter (mm)	64	Sample Specific Gravity	2,53

Sample Preparation	NMC

Effective Stress (kPa)	Time (mins)	Consolidation Reading	Voids Ratio	Strain (%)
10	120	1413	1,218	0,00
10	360	1414	1,217	0,05
33	1800	1424	1,206	0,55
65	1920	1438	1,190	1,25
127	2040	1459	1,167	2,30
251	3480	1485	1,138	3,60
498	3600	1530	1,088	5,85
993	3720	1595	1,016	9,10
1868	5160	1695	0,905	14,10
743	5280	1671	0,932	12,90
118	5400	1643	0,963	11,50
10	5520	1623	0,985	10,50

Moisture Content Calculations

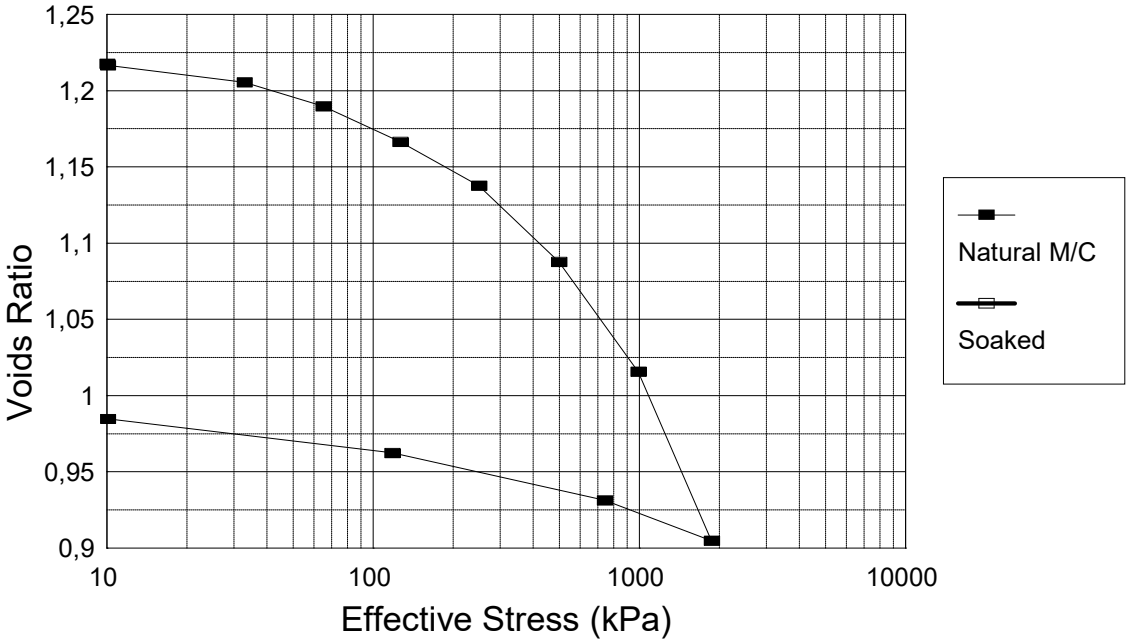
Mass wet sample plus ring before test (gms)	306,10
Mass wet sample plus ring after test (gms)	307,50
Mass dry sample plus ring (gms)	285,00
Mass ring (gms)	211,60
Moisture content before test (%)	**28,75**
Moisture content after test (%)	**30,65**

Other Data

Initial Dry Density (kg/m3)	**1141**
Initial Void Ratio	**1,22**

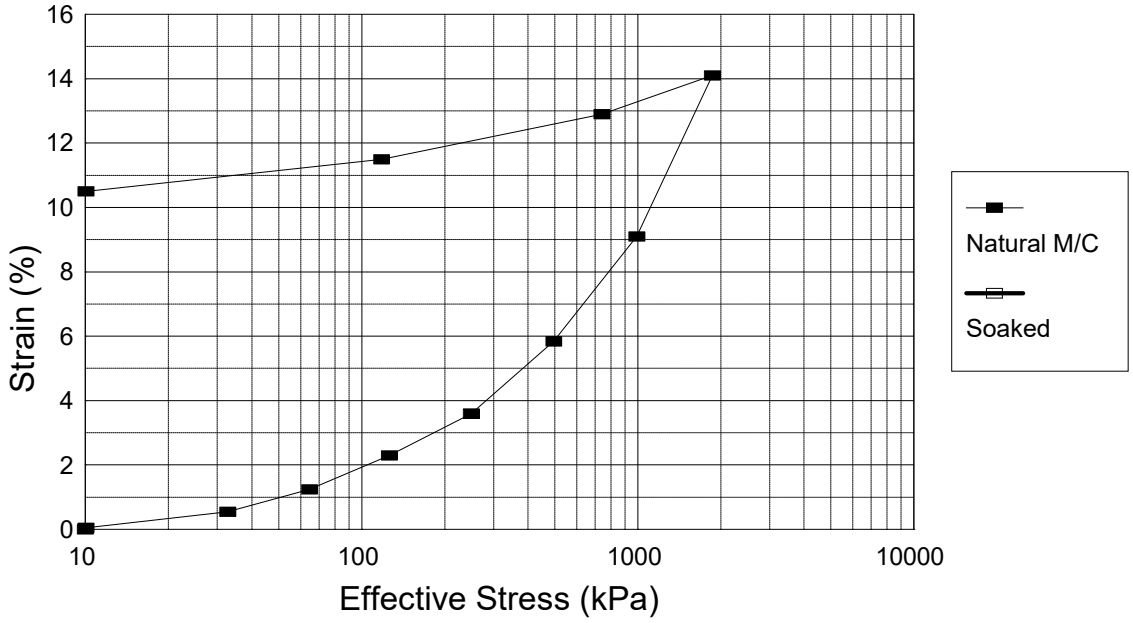
VOIDS RATIO v EFFECTIVE STRESS

Test No: 1764



STRAIN v EFFECTIVE STRESS

Test No: 1764



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SINGLE OEDOMETER CONSOLIDATION - SOAKED AT 10 kPa

Client	GEOID Geotechnical Engineers		
Location	Bultfontein TP 8 @ 2,1 - 2,3		
Date	17 May 2024	Test No	1764
Job No	24119	Checked By	EB

Sample Height (mm)	20	Sample Diameter (mm)	64	Sample Specific Gravity	2,53

Sample Preparation	NMC

Effective Stress (kPa)	Time (mins)	Consolidation Reading	Voids Ratio	Strain (%)
10	120	1413	1,218	0,00
10	360	1414	1,217	0,05
33	1800	1424	1,206	0,55
65	1920	1438	1,190	1,25
127	2040	1459	1,167	2,30
251	3480	1485	1,138	3,60
498	3600	1530	1,088	5,85
993	3720	1595	1,016	9,10
1868	5160	1695	0,905	14,10
743	5280	1671	0,932	12,90
118	5400	1643	0,963	11,50
10	5520	1623	0,985	10,50

Moisture Content Calculations

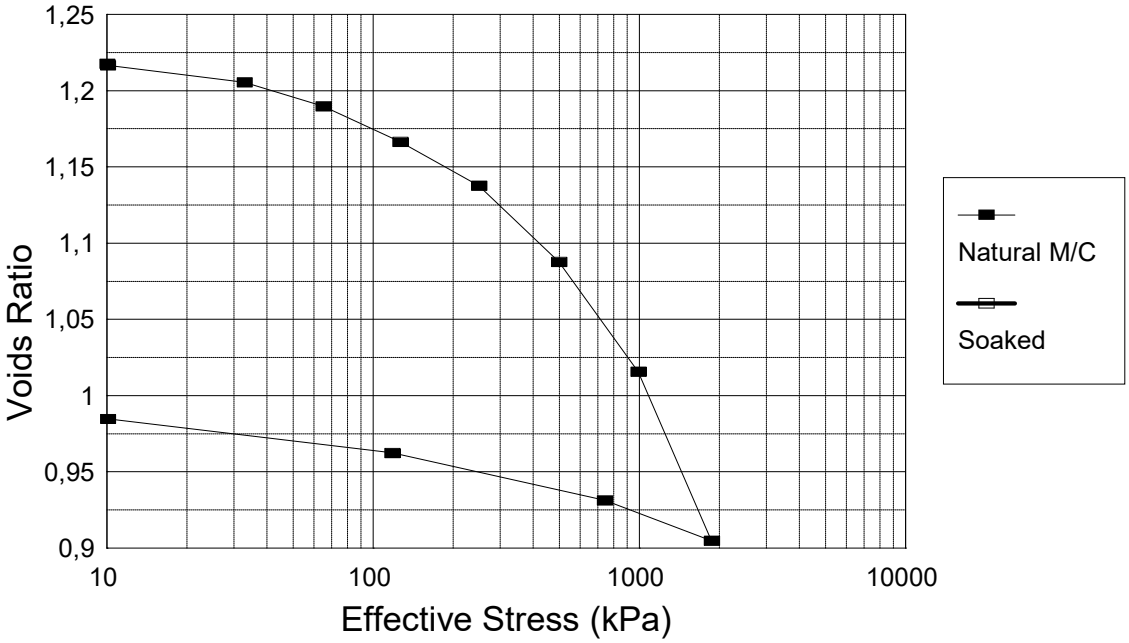
Mass wet sample plus ring before test (gms)	306,10
Mass wet sample plus ring after test (gms)	307,50
Mass dry sample plus ring (gms)	285,00
Mass ring (gms)	211,60
Moisture content before test (%)	**28,75**
Moisture content after test (%)	**30,65**

Other Data

Initial Dry Density (kg/m3)	**1141**
Initial Void Ratio	**1,22**

VOIDS RATIO v EFFECTIVE STRESS

Test No: 1764



STRAIN v EFFECTIVE STRESS

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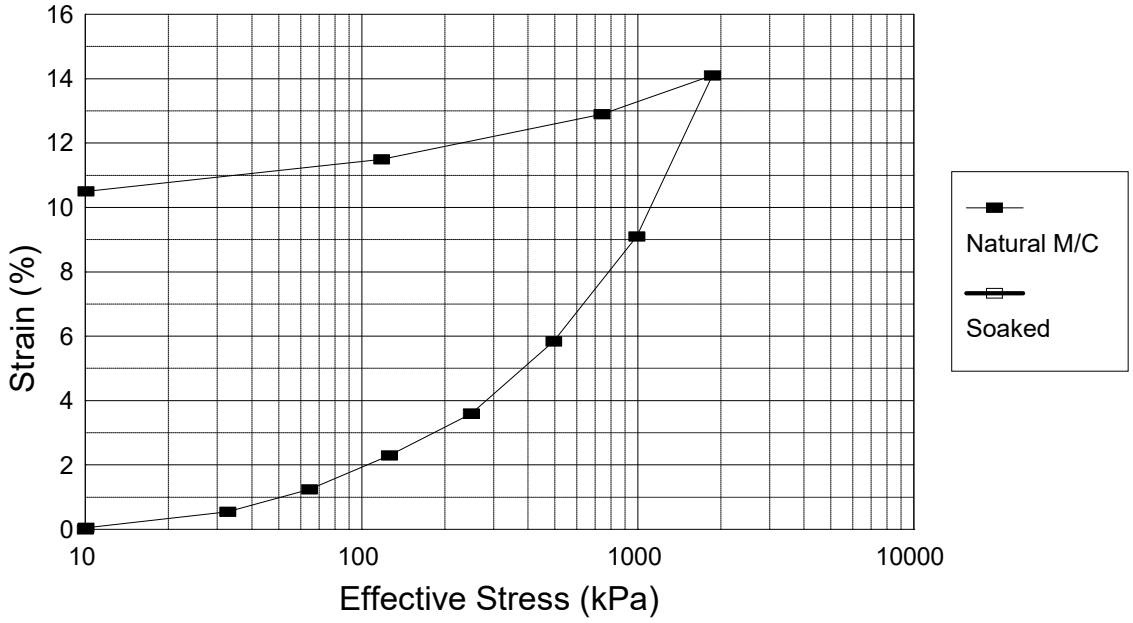

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SINGLE OEDOMETER CONSOLIDATION - SOAKED AT 10 kPa

Client	GEOID Geotechnical Engineers		
Location	Bultfontein	TP 19 @ 0,8 - 1,0m	
Date	17 May 2024	Test No	1765
Job No	24119	Checked By	EB

Sample Height (mm)	20	Sample Diameter (mm)	64	Sample Specific Gravity	2,666

Sample Preparation	NMC

Effective Stress (kPa)	Time (mins)	Consolidation Reading	Voids Ratio	Strain (%)
10	120	787	0,733	0,00
10	360	784	0,735	-0,15
33	1800	790	0,730	0,15
65	1920	800	0,721	0,65
127	2040	815	0,708	1,40
251	3480	839	0,688	2,60
498	3600	862	0,668	3,75
993	3720	898	0,636	5,55
1868	5160	940	0,600	7,65
743	5280	932	0,607	7,25
118	5400	918	0,619	6,55
10	5520	900	0,635	5,65

Moisture Content Calculations

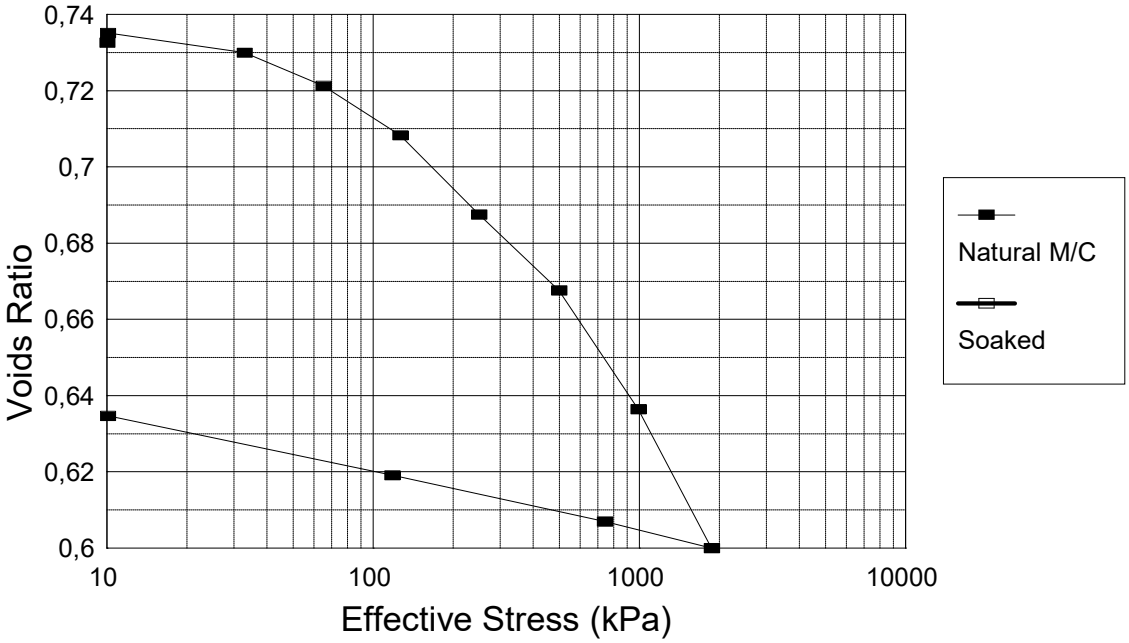
Mass wet sample plus ring before test (gms)	320,10
Mass wet sample plus ring after test (gms)	322,00
Mass dry sample plus ring (gms)	306,60
Mass ring (gms)	207,60
Moisture content before test (%)	**13,64**
Moisture content after test (%)	**15,56**

Other Data

Initial Dry Density (kg/m3)	**1539**
Initial Void Ratio	**0,73**

VOIDS RATIO v EFFECTIVE STRESS

Test No: 1765



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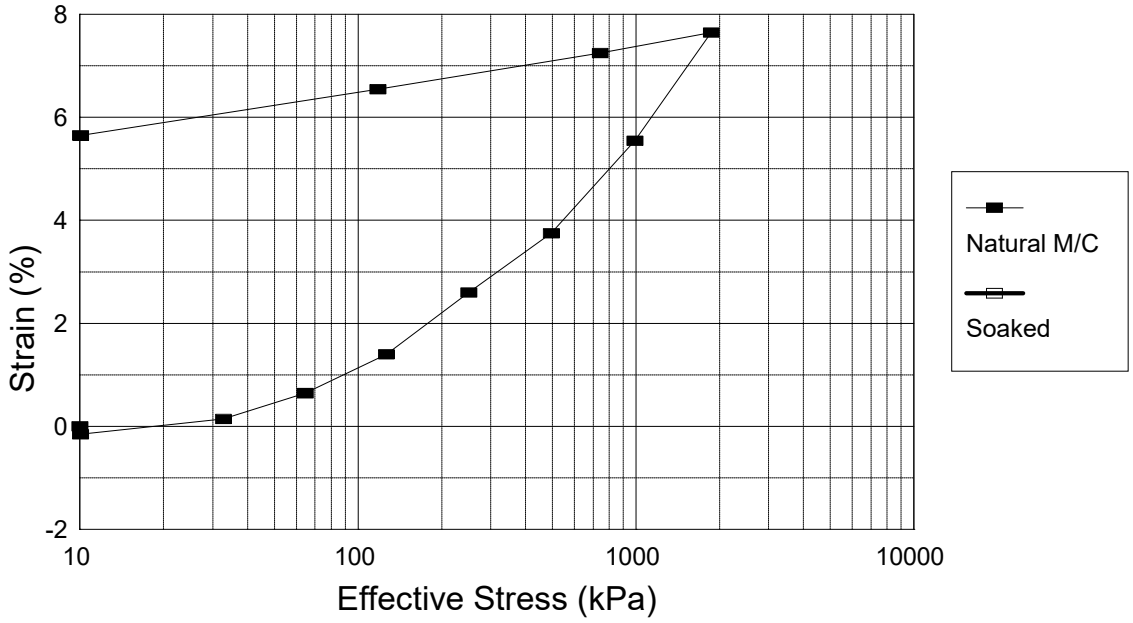

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SINGLE OEDOMETER CONSOLIDATION - SOAKED AT 10 kPa

Client	GEOID Geotechnical Engineers		
Location	Bultfontein TP 19 @ 1,6 - 1,8m		
Date	17 May 2024	Test No	1766
Job No	24119	Checked By	EB

Sample Height (mm)	20	Sample Diameter (mm)	64	Sample Specific Gravity	2,667

Sample Preparation	NMC

Effective Stress (kPa)	Time (mins)	Consolidation Reading	Voids Ratio	Strain (%)
10	120	855	0,894	0,00
10	360	848	0,901	-0,35
33	1800	856	0,893	0,05
65	1920	863	0,886	0,40
127	2040	877	0,873	1,10
251	3480	898	0,853	2,15
498	3600	928	0,825	3,65
993	3720	962	0,793	5,35
1868	5160	1000	0,757	7,25
743	5280	993	0,763	6,90
118	5400	980	0,776	6,25
10	5520	961	0,794	5,30

Moisture Content Calculations

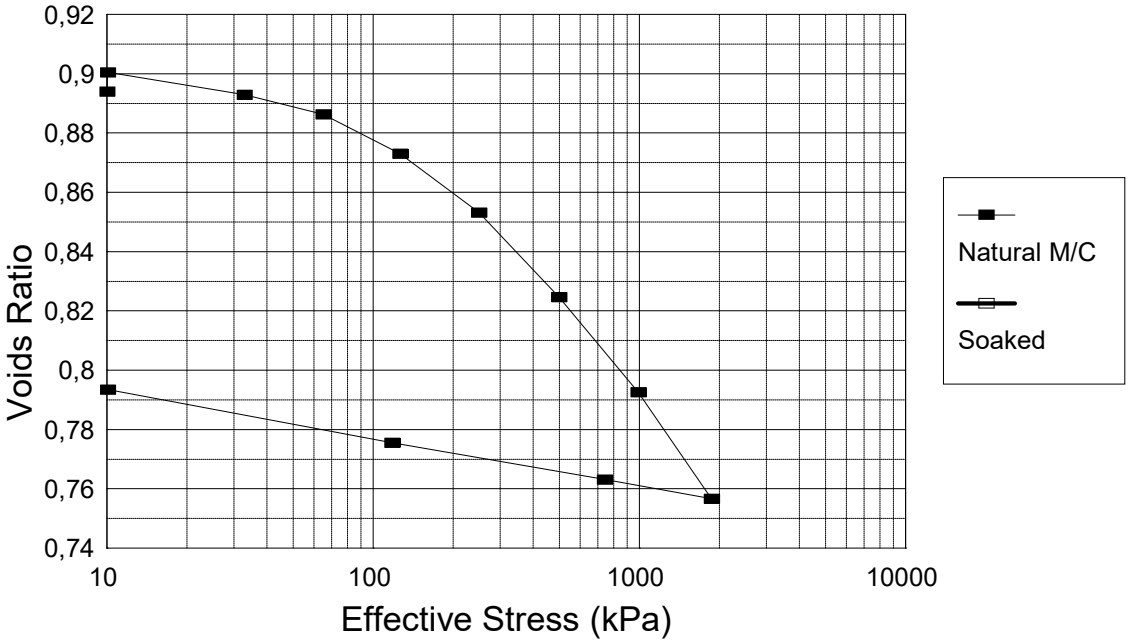
Mass wet sample plus ring before test (gms)	309,90
Mass wet sample plus ring after test (gms)	321,50
Mass dry sample plus ring (gms)	298,80
Mass ring (gms)	208,20
Moisture content before test (%)	**12,25**
Moisture content after test (%)	**25,06**

Other Data

Initial Dry Density (kg/m3)	**1408**
Initial Void Ratio	**0,89**

VOIDS RATIO v EFFECTIVE STRESS

Test No: 1766



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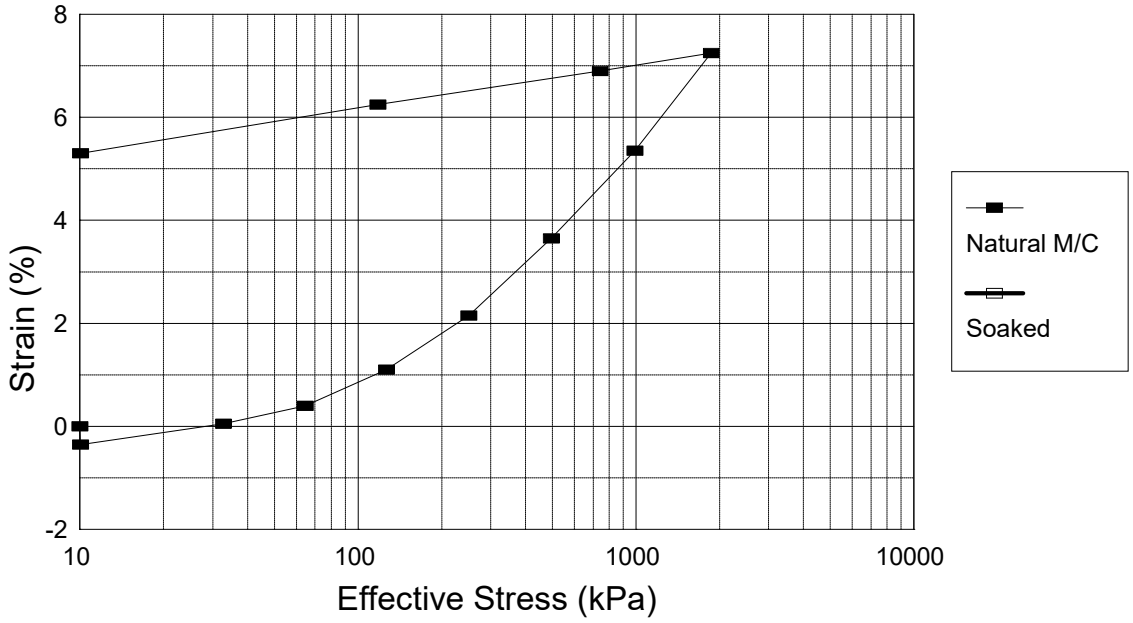

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SINGLE OEDOMETER CONSOLIDATION - SOAKED AT 10 kPa

Client	GEOID Geotechnical Engineers		
Location	Bultfontein TP 22 @ 1,2 - 1,4m		
Date	17 May 2024	Test No	1767
Job No	24119	Checked By	EB

Sample Height (mm)	20	Sample Diameter (mm)	64	Sample Specific Gravity	2,564

Sample Preparation	NMC

Effective Stress (kPa)	Time (mins)	Consolidation Reading	Voids Ratio	Strain (%)
10	120	906	1,248	0,00
10	360	899	1,255	-0,35
33	1800	914	1,239	0,40
65	1920	936	1,214	1,50
127	2040	962	1,185	2,80
251	3480	998	1,144	4,60
498	3600	1044	1,092	6,90
993	3720	1102	1,027	9,80
1868	5160	1178	0,942	13,60
743	5280	1162	0,960	12,80
118	5400	1132	0,994	11,30
10	5520	1092	1,038	9,30

Moisture Content Calculations

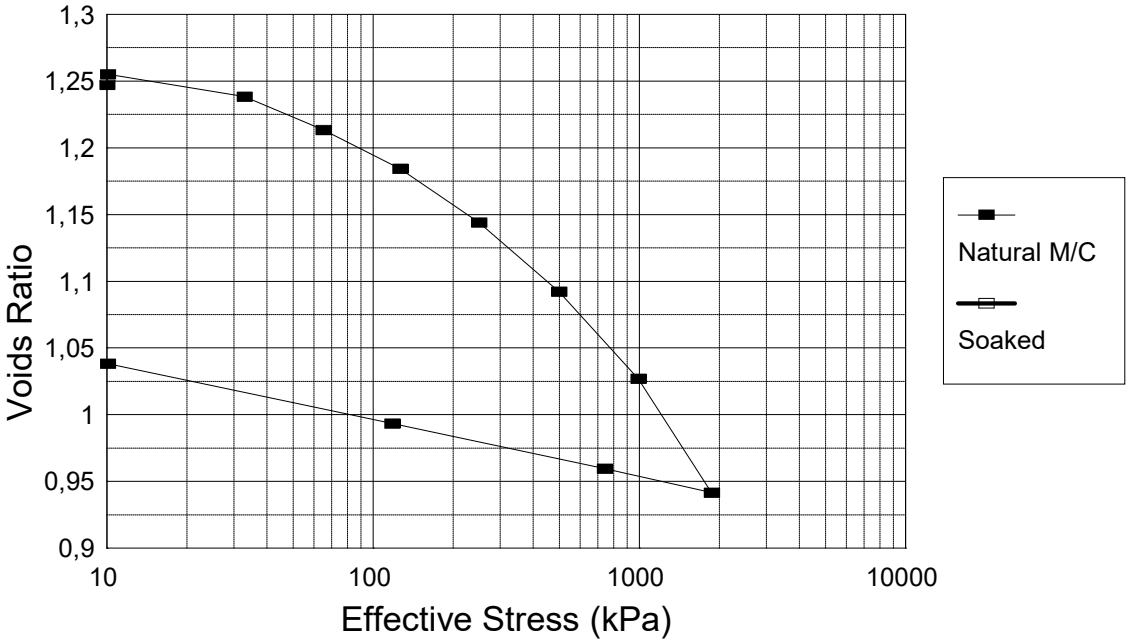
Mass wet sample plus ring before test (gms)	306,10
Mass wet sample plus ring after test (gms)	307,50
Mass dry sample plus ring (gms)	285,00
Mass ring (gms)	211,60
Moisture content before test (%)	**28,75**
Moisture content after test (%)	**30,65**

Other Data

Initial Dry Density (kg/m3)	**1141**
Initial Void Ratio	**1,25**

VOIDS RATIO v EFFECTIVE STRESS

Test No: 1767



STRAIN v EFFECTIVE STRESS

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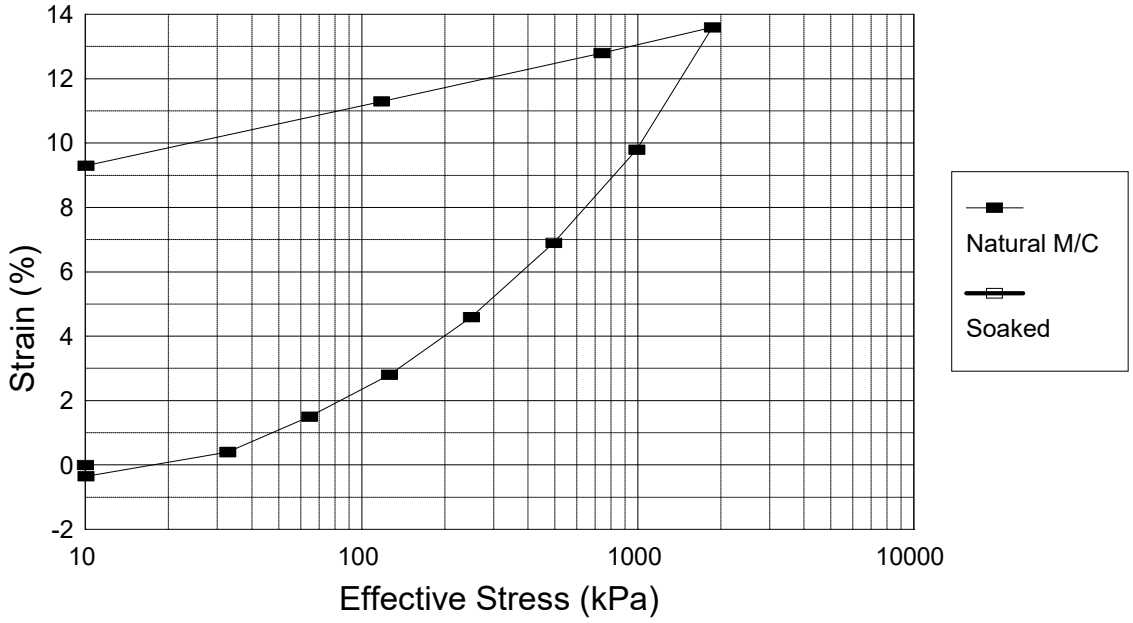

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SINGLE OEDOMETER CONSOLIDATION - SOAKED AT 10 kPa

Client	GEOID GEOTECHNICAL ENGINEERS		
Location	HIRE ALL - LANSERIA	TP 111 / U111 / 1 @ 0,5 - 0,7m	
Date	13 MARCH 2018	Test No	876
Job No	18083	Checked By	MM

Sample Height (mm)	20	Sample Diameter (mm)	64	Sample Specific Gravity	2.552

Sample Preparation	NMC

Effective Stress (kPa)	Time (mins)	Consolidation Reading	Voids Ratio	Strain (%)
10	120	918	1.169	0.00
10	360	913	1.174	-0.25
33	1800	918	1.169	0.00
65	1920	929	1.157	0.55
127	2040	945	1.140	1.35
251	3480	964	1.119	2.30
498	3600	989	1.092	3.55
993	3800	1025	1.053	5.35
1868	5280	1070	1.004	7.60
743	5400	1060	1.015	7.10
118	5520	1041	1.036	6.15
10	5640	1011	1.068	4.65

Moisture Content Calculations

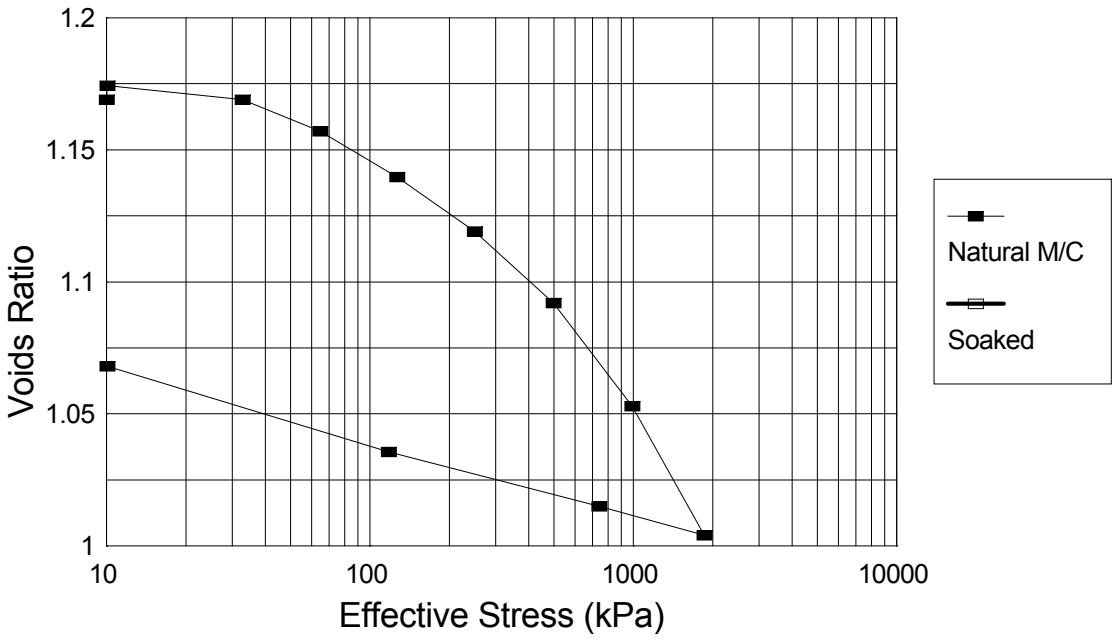
Mass wet sample plus ring before test (gms)	297.70
Mass wet sample plus ring after test (gms)	304.60
Mass dry sample plus ring (gms)	288.80
Mass ring (gms)	213.10
Moisture content before test (%)	**11.76**
Moisture content after test (%)	**20.87**

Other Data

Initial Dry Density (kg/m3)	**1177**
Initial Void Ratio	**1.17**

VOIDS RATIO v EFFECTIVE STRESS

Test No: 876



STRAIN v EFFECTIVE STRESS

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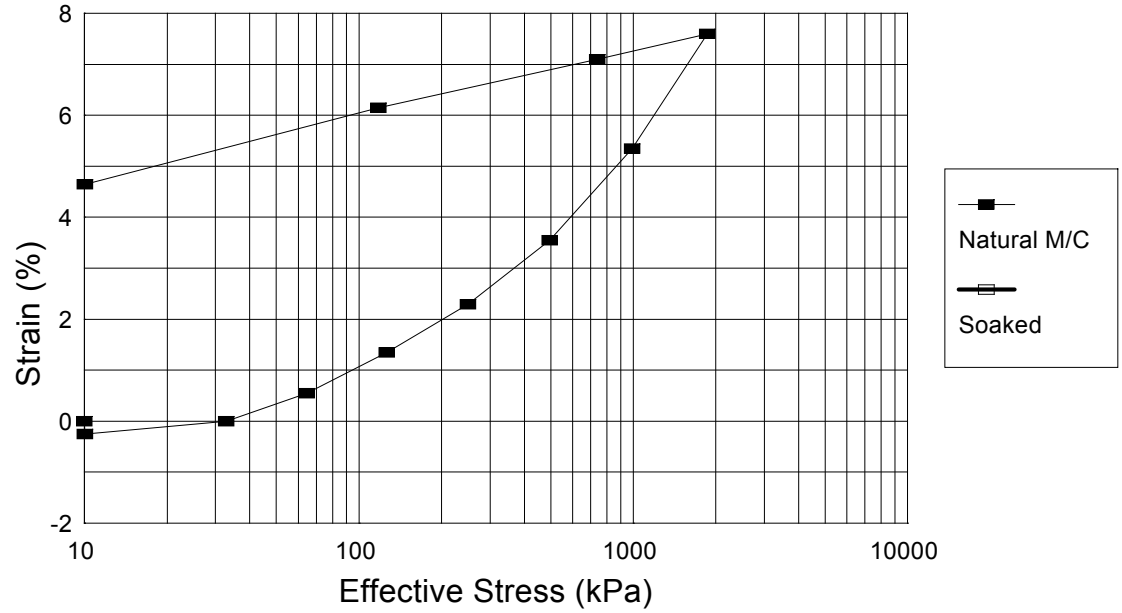

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SINGLE OEDOMETER CONSOLIDATION - SOAKED AT 10 kPa

Client	GEOID GEOTECHNICAL ENGINEERS		
Location	HIRE ALL - LANSERIA	TP 111 / U111 / 1 @ 0,5 - 0,7m	
Date	13 MARCH 2018	Test No	876
Job No	18083	Checked By	MM

Sample Height (mm)	20	Sample Diameter (mm)	64	Sample Specific Gravity	2.552

Sample Preparation	NMC

Effective Stress (kPa)	Time (mins)	Consolidation Reading	Voids Ratio	Strain (%)
10	120	918	1.169	0.00
10	360	913	1.174	-0.25
33	1800	918	1.169	0.00
65	1920	929	1.157	0.55
127	2040	945	1.140	1.35
251	3480	964	1.119	2.30
498	3600	989	1.092	3.55
993	3800	1025	1.053	5.35
1868	5280	1070	1.004	7.60
743	5400	1060	1.015	7.10
118	5520	1041	1.036	6.15
10	5640	1011	1.068	4.65

Moisture Content Calculations

Mass wet sample plus ring before test (gms)	297.70
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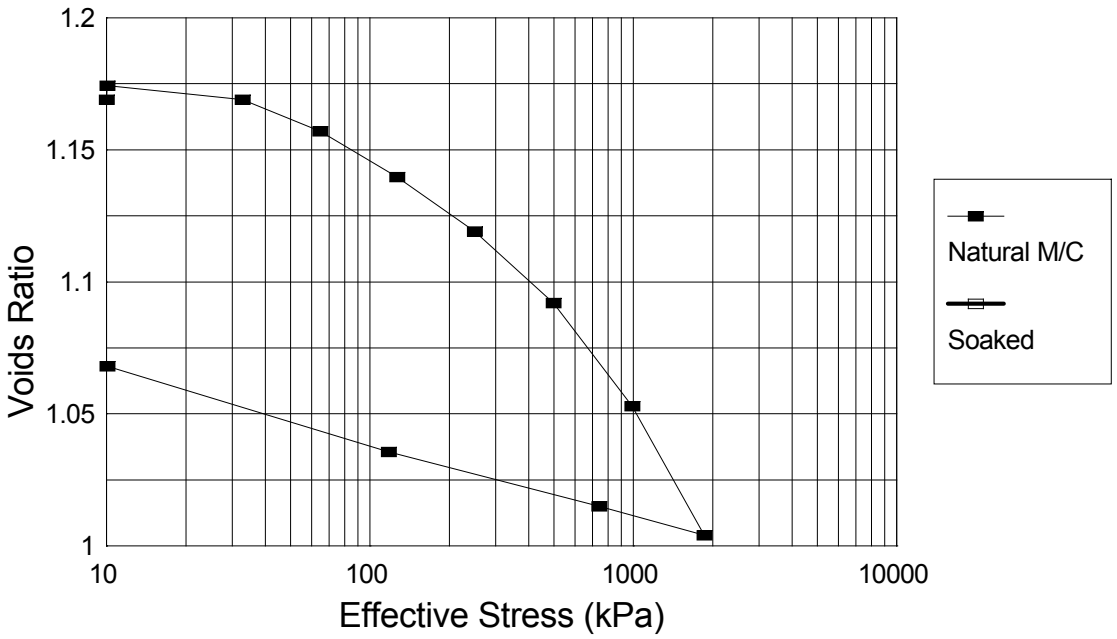
Mass dry sample plus ring (gms)	288.80
Mass ring (gms)	213.10
Moisture content before test (%)	**11.76**
Moisture content after test (%)	**20.87**

Other Data

Initial Dry Density (kg/m3)	**1177**
Initial Void Ratio	**1.17**

VOIDS RATIO v EFFECTIVE STRESS

Test No: 876



STRAIN v EFFECTIVE STRESS

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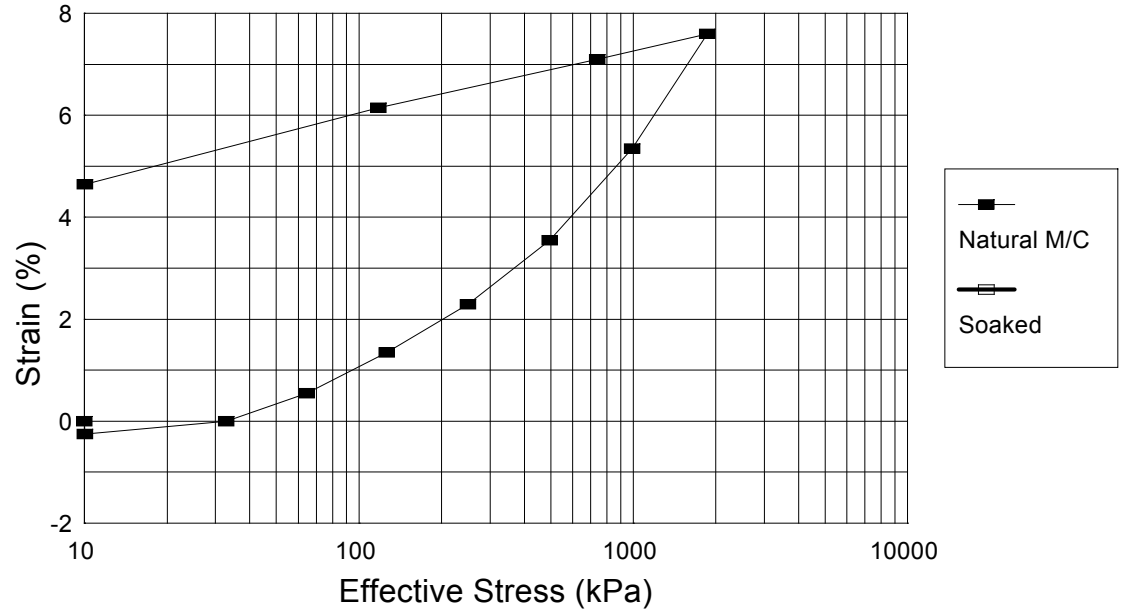

APPENDIX E

Site Classification Rationale

Site Classification Rationale

In terms of the investigation guidelines, it is necessary to classify the proposed township into Site Classes according to the requirements of the NHBRC Building Manual and the Code of Practice (COP) for Foundations and Superstructures for Single Storey Residential Buildings of Masonry Construction compiled by the Joint Structural Division of the SAICE and the IStructE.

According to the GFSH-2 *Guidelines for Urban Engineering Geological Investigation*, any site can be divided into one of three primary Geotechnical Sub-Areas which indicate the **general development potential** of an area, as summarised in Table 3. The first objective is thus to classify the site in terms of its development potential according to geotechnical, geo-hydrological and environmental considerations highlighted in the study.

The second objective is then met by applying the COP to categorise areas with **common site / founding characteristics** and **potential foundation movements**, giving recommendations for typical founding options for single-storey building of masonry construction. The assumptions on which these recommendations are based include a maximum foundation bearing pressure of 50kPa applied through minimum 0.6m wide strip foundations installed at approximately 0.4m below natural ground surface. A summary of the various Site Classes for which a site may be classified, is contained in Table 4.

As an example, a site class of 2/C/H/R(locally) as defined in accordance with Tables 1 and 2 is thus associated with a developable site (with precautions) (2), with collapse and/or consolidation settlement potential of less than 5mm (C), heave/shrinkage potential of less than 7,5mm (H) and (local) occurrences of rock outcrop or shallow sub-outcrop (R).

Geotechnical Constraints on Planned Development

Prefix	Development Potential	Impact of Geotechnical Character of Area on Construction Measures
1	The geotechnical conditions are such that urban development can take place without any special precautionary/remedial measures for geotechnical conditions.	- None - Normal building construction
2	Geotechnical conditions are such that the area may be developed for urban use, but appropriate remedial measures and/or precautionary measures are required in the context of the geotechnical constraints.	- Problem Soils - Special foundation and top structure requirements
3	Geotechnical conditions are such that urban development is not recommended.	- Severe Geotechnical or Environmental Constraints - Development not recommended / permitted

Typical Residential Site Class Designations

Site Class	Typical Founding Material	Character of Founding Material	Expected Range of Total Soil Movements (mm)	Assumed Differential Movement (% of Total)
R	Rock (excluding mud rocks which may exhibit swelling to some depth)	Stable	Negligible	-
H H1 H2 H3	Fine grained soils with moderate to very high plasticity (clays, silty clays, clayey silts and sandy clays)	Expansive Soils	<7.5 7.5 - 15 15 - 30 >30	50% 50% 50% 50%
C C1 C2	Silty sands, sands, sandy and gravelly soils	Compressible and Potentially Collapsible Soils	<5.0 5.0 - 10 >10	75% 75% 75%
S S1 S2	Fine grained soils (clayey silts and clayey sands of low plasticity), sands, sandy and gravelly soils	Compressible Soil	<10 10 - 20 >20	50% 50% 50%
P	Contaminated soils Controlled fill Uncontrolled fill Land fill Mine waste fill Mining subsidence Dolomitic areas Marshy areas Reclaimed areas Very soft silt/silty clays Landslip	Variable	Variable	
W	Development probably controlled by floodline considerations	N/A	N/A	N/A